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**3<sup>th</sup> CONFERENCE OF INTERDISCIPLINARY  
RESEARCH ON REAL ESTATE**

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## Word of the Conference Chairperson

Grateful for all the support we were lucky enough to receive, it is with pleasure that I write this foreword to the proceedings of the 3<sup>th</sup> Conference Interdisciplinary Research on Real Estate (CIRRE) held at the Hanze University of Applied Sciences in Groningen, the Netherlands, on September 20-21, 2018.

Our social environment is rapidly changing and has a large impact on future real estate propositions, both physically and digitally. As such, interdisciplinary research into real estate provides orientation for aligning real estate versatily with future social issues across the spectrum with the following ten themes: (1) Real Estate Studies and Analysis, (2) Sustainability in Environment, Economic, Social and Cultural context, (3) Market and Marketability, (4) Facilities Management, (5) Urban planning and Design, (6) Housing and Rural-Urban studies, (7) Socio-Economic, Psychological, Living environment, Demographic researcher, (8), Business, Economics and Management, (9) Policy and Practice and (10) Research methods.

CIRRE unites researchers and professionals to start a dialogue about interdisciplinary research, its influence on the built environment, and interactions with stakeholders in an international, scientific and professional perspective. In addition to the more than 100 (presented) reviewed papers and about 100 participants from countries worldwide, many workshops and invited keynote presentations were given by René Paas (King's Commissioner of the province of Groningen) about the developments of the province of Groningen and the influence on real estate, Erwin van der Krabben (professor of Radboud University Nijmegen, the Netherlands) about the role of social real estate in area development and Rob Verhofstad (vice-president Executive Board Hanze University of Applied Sciences Groningen) about the importance of the triad of research, education and the work field for universities.

I hope that these proceedings will offer new paradigm shifts for committing real estate as a versatile resource in order to give social issues an impulse towards the future. As such, I would like to thank everyone who has contributed to this conference for their effort.

And, last but not least, there are things we do not know or are unaware of and of which we do not even know that we do not know them. A hidden ignorance that influences our thinking and lives, a field where we are hypocognitive (Wu & Dunning 2018, Hypocognition: Making Sense of the Landscape Beyond One's Conceptual Reach). We might sometimes have a vague feeling of there being something else, with attention to the Dunning-Kruger effect: the phenomenon that especially those people with no knowledge of matters miss the expertise to realize that they have no knowledge of matters. This leads them to mistakenly believe they know a great deal. I look forward to seeing you again at the next CIRRE conference.

**Jan Veuger**, Conference Chairperson  
Professor Real Estate

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# 1. Building Projects

## 1.1. Value sharing model for urban development

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### 1.1.1. Abstract

**Purpose:** The paper discuss models for urban areas that generate shared value creation for community, users and commercial actors-over time. The background for the project is the recognition that there is a clear correlation between the design of the built environment, individual quality of life, the community social structure and business development. Extensive research shows that the development of urban areas must be linked more closely to an understanding of the development of financial sustainability as a consequence of societal improvements as reduced inequality and lack of inclusion. Lack of understanding of this context leads to cities and towns as in far less than desirable capabilities to create value for the residents, the business world and society as a whole.

**Design/methodology/approach:** The research is a literature review from the fields of facility management, urban design, economy, business models, social security, technology and ethics.

**Findings:** The model of urban value ecosystem is seen as an open governance model, active community involvement and new business orientation to share the value with citizens. Within the process of creating the urban value ecosystem, and changes toward healthier and happier environment, the role and complexity of facility manager is important to see, as the main facilitator of changes. Here, the urban facility manager is seen in accordance as the one to initiate and support the changes for better interaction with the built environment, and toward enabling the health, well-being and quality of life of the world's societies and population through services it manages and delivers.

**Originality/value:** The value is to see the benefits of 'socio-economy' to enrich the societal groups (employees in companies, residents in residential places, owners of the flats in buildings, users of public buildings etc.), change the business model (urban value capture model), modify forms of management (more proactive role for FM in the urban context) and initiate new services for FM. The last should be oriented toward social responsibility, giving a better understanding of the societal effect of using collective impact as an objective of city development.

**Keywords:** Building projects, Project models, Outcome.

### 1.1.2. Introduction

The paper addresses the principles of the built environment that enable maximising the economic, social and environmental opportunities of inhabitants, thereby laying the foundations for a , prosperity and health. The core attributes of the principles discussed are open governance, value orientation and community engagement. The objective is to develop a model for sustainable urban development based on value sharing and an understanding of urban "ecosystems" as one where economic success creates societal improvements. The main stakeholder groups examined are users and commercial actors.

Over the last two decades, several initiatives have been successfully carried out according to the first principle of Rio Declaration on Environment and Development (1992). In this declaration, it is stated that that human beings are at the centre of concerns for sustainable development and that people are entitled to a healthy and productive life in harmony with nature. Cities pose significant challenges to the intent of the declaration.

Currently, cities are estimated to produce as much as 78% of global emissions of greenhouse gases (GHG). In the near future, this percentage will most probably continue to increase. The world's urban population is expected to expand so that 60% living in cities by 2030 (<https://unhabitat.org/urban-themes/climate-change/>). While this situation thus will continue to pose problems, it is also possible to view cities as potential solution drivers of transformative action through sectoral, demographic, spatial and ecological initiatives (Hughes, Chu and Mason, 2018). Policymakers view cities as situated at the core of both challenges and potential solutions. This is underpinned by the Paris Agreement (2015), the UNFCCC and the Sustainable Development Goals.

From an urban perspective, many cities have initiated successful projects regarding sustainable development. Still, there is a huge potential of refurbishment of existing buildings. The GHG-reducing potential of such buildings is in fact immense, since they contribute to 40% of total use of energy from fossil sources. The Buildings Performance Institute Europe emphasis that 97,5% of the building stock is currently not in the so-called A class, and should therefore be upgraded (<http://bpie.eu/publications/>).

The sustainable refurbishment concept is orientated toward environmental footprint reduction. It includes the concept of maximizing the building's economic performance and check the indicators, such as: technical condition, usability situation, adaptability and indoor climate (<https://sustainablerefurbishment.wordpress.com/>). What is stressed in different program funding calls, such as Urban Europe, Horizon 2020, EERA and similar is that much of the knowledge is not accessible to potential users and is not easily implemented. Implementation of new solutions should not be hindered by institutional barriers (e.g. standards, regulations, installations and procurement), social barriers ( the resistance of organisations and individuals to accept new ways of doing things) and financial barriers (typically business models not easily adapted to implement social innovations, or insufficient possibilities for scaling up innovations).

Extensive research also shows that the development of cities should be linked more closely to an understanding of the development of financial sustainability and, as a consequence, of social improvements, to meet upcoming social and economic challenges (ref. OECD). New economic theories concerning value participation focus on establishing models to ensure sustainable businesses, so the theories look at whether they can become the governing element for urban area development (Massa et al, 2016, Harvard Business School, 2017, 2016, Zhao, 2012). Further, the research points to that altering business models and an intensified interaction between business and public administration is necessary. There exists, in fact, a fundamental need for measuring of the relationship between social success for residents and financial success of the business and welfare in the community. Such measurements cannot be carried out in a vacuum – a reliable model is needed. The fundamental insight governing the essay of the present paper to produce such a model is that business models should evolve from not only in investing in the object but to also invest in social security – with the intention of ensuring will long-term returns of investments. Such value creation (Salaj et al. 2018, Hjelmbrekke et al, 2017) will enable a change in the future of models for urban development, in particular concerning the role of citizens and communities to take more of an active role.

This conceptual paper presents a model for business models enhancing long-term benefits through innovative value creation and value sharing. The pillars of the model are new innovative governance, practices and



business models. More specifically – and based on the literature search proceeding the model presented in this paper – three areas where innovative models can prove benefits and implement ability for sharing value and innovative services are found to be:

- participations to the population's long-term social needs (life cycle social needs);
- investments that can maintain that citizens take a share of the increased market value in order to safeguard their investment needs (value orientation); and
- practices that facilitate interaction between communities and business, with the ambition to increase attractiveness for communities and improve competitiveness for business, and so ensure the value creation in a long time perspective (urban ecosystem).

The research Topic includes ways of sustainable reusing and reprogramming of existing buildings, open spaces and (infra) structures. The reduction of energy consumption is seen through the new innovative model of socio-creative economy, which includes public authorities, business stakeholders, civil society actors and citizens, to develop better balance between the dominance of business imperative and shareholder value with the public interest. The other challenge is how to radically improve the understanding of how socially, economically and environmentally sustainable urban areas are and how to make local urban ecosystem more resilient. From that point of view, it is important to discuss the urban public administration and services innovation to develop mechanisms for integration of different policies as well scenarios and transition pathways and urban data management to increase quality and availability of data to support policy making for sustainable urbanisation.

### **1.1.3. Method**

The method is a literature review focused on original research of sustainability topics, existing buildings, business model, community engagement and FM (Facility Management). This review provides an overview of mostly theory and empirical evidence available and aims to (a) examine the partnership models in the process of sustainable urbanisation and (b) examine the mechanisms for community engagement theory to learn how to increase the individual and social motivation to change the behaviour.

The literature search was conducted using the Scopus database, Google scholar and a hand search (snowball method). Search terms in both databases were combinations of the following key words: 'sustainability', 'facility management', 'community engagement', 'socio-economic model', 'existing building', 'value orientation' and keywords. These search terms aim to give a general overview of the field. Mostly peer-reviewed papers were included into literature review, but also some additional internet resources are added.

The research is based on a short literature review to see different opportunities how to deal with challenges, written above. The literature was focused on the authors, who published papers on the thematic of the community engagement, facility management, value orientation and new partnerships.

### **1.1.4. Research**

Based on an analysis of socio-economic development, De Rosa (2018) listed different categories of stakeholder groups. Among these, three stand out as of particular interest for the partnership model, notably the local community, society as a whole and the value chain actors. These actors are characterised as having particular interests, as listed below:

- local community: access to material resources, access to immaterial resources, delocalization and migration, cultural heritage, safe and healthy living condition, respect of indigenous rights, community engagement, local employment, secure living conditions;
- society: public commitments in sustainability issues, contribution to economic development, prevention and mitigation of conflicts, technology development; corruption, and
- value chain actors: fair competition, promoting social responsibility, supplier relationships, respect of intellectual property rights.

Åshild Lappegard Hauge: Multilevel-networks for climate adaptation - what works?

In this paper, experiences with social strategies concerning how to engage citizens in climate mitigation and adaptation were examined. Hauge points out the psychological approach of engagement of different stakeholders through understanding of human behaviours, perceptions, motivations and abilities when meeting climate change. The approach that should be seen together with and in addition to structural changes, like regulations, insurance etc. Insights from psychological approaches on how to engage citizens in the climate cause proved to offer valuable insight into typical challenges found concerning human behaviour, perception, motivation and capacities when facing climate change (Clayton et al., 2016). In addition to structural changes (changes in laws and regulations, insurance, incitements etc), different forms of pro-environmental communication were found to enable changes in behaviour patterns (Klockner, 2015, Gifford, 2011). Based on learning about climate mitigation and adaptation in social settings, she points opportunities to take advantage of the social mechanisms that influence human attitudes and actions, such as: social norms (Stoknes, 2015), competition (Griskivicius et al, 2010), praise and acknowledgement (Cialdini and Goldstein, 2004), social-identity theory (Klockner, 2015), pilot examples (Hauge et al, 2013), social learning (Clayton et al, 2016), attention from others (Zajonc, 1980), face-to-face stronger together and consensus (Stoknes, 2015).

Carmel Margaret Lindkvist, Contextualizing learning approaches which shape BIM for maintenance.

Lindkvist states, based on her research, that social indicators for sustainable communities are important to identify suitable strategies for developing an area and to reflect on progress. She also emphasised that the planning of the regeneration of a neighbourhood in a city environment does not just involve the specific location, but also its connectivity to the wider environment. A proper understanding of this connectivity is often lacking in the planning of the built environment (Dixon, Eames et al. 2014). The social element of how an area/district is used, maintained and adapted to new solutions should be considered within planning and environmental action in order to have a real impact on sustainable goals (Dale et al., 2010). While use is considered in urban planning, the link to maintainability and adaptability of an area is not. Developing the link of design to facilities management is important for maintainability and increasing the attainability of meeting sustainable goals. This is illustrated in a number of studies of the built environment (e.g. Whyte et al., 2016; Fedoruk et al., 2015 and Forcada et al., 2015). Carmel also sees that the combination of expert-led and community-based facilitates the potential for both grass root origins and scientific rigor in developing social sustainable indicators, which links, to the wider context of city and region.

Svein Bjørberg, Public Buildings - From Decay to Model of Excellence.

Svein's idea of better modelling the built environment in accordance to social needs later culminated in the project Oscar – value for owner and user of building. The topic of maintaining the well-functioning society and business over a long time depends on urban and urban settlements development to safeguard the population's social needs through the entire life cycle, is still a subject to research. In several papers through the period, he stressed that most important social need is for the community to adapted to deliver the various benefits that should ensure safety at all life stages. The inhabitants' needs for housing, facility management, social services, health services, etc., change over their lifetime. For inhabitants, independent living, housing and services are important prerequisites during their entire life. The demands for residential places differ on social and individual characteristics, including the different age groups (Bjørberg and Temeljotov 2012). Business models should be changed from to invest only in the object to also invest in social security to ensure long-term investment returns. This makes great demands on the research-based expertise in management, sociology and economics.

Hallgrim Hjellmbrekke, Ole Jonny Klakegg and Jardar Lohne Governing value creation in construction project: a new model

Hallgrim et al research focus is on value creation. The term is understood as being the result of human activity and this is the only source of new value. On basis of this fundamental insight, different value-related terms arise, such as: value creation, use value, exchange value, captured value and value proposition. Hallgrim found a lack of understanding the project owner's/users strategic objectives and a lack of methodology for translating them into functional buildings. The research shows the movement of the main project target from

finished building toward the effect of owning and using it over its lifetime. In the construction industry, both in Norway and internationally, this is a new approach that requires in-depth knowledge of the owner, core business, user and life cycle planning to prepare new models and processes.

In urban development, value sharing is seen as the important one and his understanding of urban "ecosystems" is similar to the so-called "The ecosystem of Shared Value" (Harvard Business Review, 2016), which is as a state where economic success contribute to creating societal improvements. **Shared value is seen through the lenses of social responsibility, philanthropy or sustainability, but a new way for companies to achieve economic success."** (Porter and Kramer, 2011). *This model is seen to be able to facilitate interaction between communities and business where development measures be scheduled with the requirements for a positive cost/benefit ratio and increased attractiveness for communities and improved competitive advantage for the business community.*

#### Zhao, Das, Larson, Joint development as a value capture strategy for public transit finance

Researchers presented different Value Capture strategies on the cases for funding public transport. Some of them are interesting for the neighbourhoods. Joint development based on public ownership, Transactions involving development rights – a public agency owns land adjacent to its facilities, and it sells, leases, or awards associated development rights to encourage development of a site and to generate revenues. Cases: Rail Property Hong Kong (The Metropolitan Transit Railway Corporation), Development Rights award Portland (The Red Line Airport). Joint development based on private ownership, Transactions involving privately owned property - the public entity exact the land from private property owners, who in exchange receive benefits in the form of property improvement. Cases: Land readjustment model Tokyo, Land acquisition and land consolidation Taipei. Joint development based on private ownership, Transaction involving development rights – private property owners are willing to contribute in exchange for property rights. Cases: Usage adjustments Taipei, Density bonus New York City.

Findings show an increase in benefits such as: economic - joint development models may have advantages over traditional project delivery due to the interaction of cost sharing and benefit sharing; political - joint development is more politically acceptable than tax increases. Some disadvantages are also listed, such as: joint development is administratively challenging, and joint development may raise concerns over geographic equity, as it may incur mismatch of benefits and costs for people living in different localities.

#### David Bogataj, Diego McDonnell, Alenka Temeljotov Salaj, Marija Bogataj, Sustainable Urban Growth in Ageing Regions: Delivering a Value to the Community

The authors discuss the unbalanced flow of people, money, information, goods and services within EU, with the main question how to balance the European wealth and facilitate the flows to achieve wellbeing for all generations. The article addresses the question of how comprehensive modelling of interactions between demographic change (ageing and migration patterns), housing dynamics (urbanization), real estate market on the bases of changing urban land rent differentials, taxation (local and state regulation) and mortgage credit provision (financial system) can support decisions with the aim of financial and housing crises prevention and sustainable growth of cities. The impact of improvement is seen in improvement of services (supply chain management, logistics) on attractiveness and therefore on migrations and commuting influence housing market (Drobne and Bogataj, 2012). Among other consequences, the connection of existing models through the so-called gravity model is seen, where better facility management and improved supply systems increase the parameters of attractiveness and stickiness in the model. Therefore, the migration flows, which increase demand of housing and therefore the value of bid rent. Also mapping of the availability, affordability, and adaptability of the built environment and required services would provide better support to policy makers.

#### Jan Lilliendahl Larsen, Morten Elle, Brigitte Hoffmann, Peter Munthe-Kaas, Urbanising facilities management: the challenges in a creative age

The authors present the challenge of creative economy for FM practice and research based on a comparison between FM and the field of urban planning. A key concept for the inquiry was 'facilitating creative environments'. Their literature review revealed some cases where urbanists and FM tried to align their forces

and develop new environments, such as 'back to community' corporation and 'living experiment in the application of Urban FM', where they try to find a balance between the dominance of business imperative and shareholder value and FM with the public interest. Other cases identified were more focused on corporate governance with 'long term presence of built assets in community' or 'contribution that facilities make to local economy and community', 'social enterprise – a business with primarily social objectives' and new 'value chain with the community' or look for the 'FM role in broader social perspective'.

Findings show that FM bears resemblance with the discipline of urban planning, but more knowledge of social theory should be included in the field of FM. They found inspiration for the facilitation of creative environments to facilitation of creative environments in the perspective within the urban planning called 'the life between the buildings', that gives opportunities to create spaces for informal social interaction.

Alenka Temeljotov Salaj, Athena Roumboutsos, Peter Verlič in Bojan Grum, Land value capture strategies in PPP - what can FM learn from it?

In this paper, the main focus of attention is the description of the value capture model,. In short, the model is based on a search for generating revenue by extracting a portion of the gains in the value of land and property that result from improvements to transportation networks. The objective of this paper was to present the opportunities for FM on the level of participating more actively in the development of new area to help to build a competitive and healthy area with high quality for residence, business and spare time (Temeljotov, 2006). The research shows that in this it is crucial to ensure the conditions in which the private partner will recognize in the project the possibility to share profits during the economic life of the project (Roumboutsos and Temeljotov, 2013). The analysis shows that the participants quicker decide to join the PPP if they invest in the project, so that the potential profit from related changing of the value of property during the life is assured.

The term Land value capture (LVC) denotes the value capture of an increase value of land and help to build competitive areas (Zhao, 2012). This is seen as a huge opportunity for the strategic level of Facility Management (FM), when addressing property asset, urban FM, community-based FM and new facility service opportunities. LVC together with FM can stress community alignments for better value initiatives. This includes two major trends: firstly, broadening and deepening of the engagement between the private and public sectors in the provisions of community services (better services for the community); and secondly, putting people first, in the sense of pulling public and voluntary agencies to share information and expertise in new ways (creative environments).

Alenka Temeljotov Salaj, Svein Bjørberg, Marit Støre-Valen, Carmel Margaret Lindkvist, Jardar Lohne, Jardar, Urban Facility Management Role

In the paper, a new focus on an ethical consideration of FM development was put from Jardar. He stated that concerning the influence of demography on FM, the aging population seems the trend of most consequence. The number of elderly will increase and thus the need for FM services also. Technological development will change toward more sophisticated solutions, like robotics, drones and similar. Security perspectives are bound to occupy a significant place within the FM discourse over the next years. The most spectacular aspect of security concerns the actual potential to maintain facilities with a large potential for hostile action, such as government buildings, critical infrastructure facilities etc. Less obvious, however, is the need for increased security measures within what is outlined to be more commonplace structures (e.g. community-based social infrastructure, shared solutions, increased density of habitation etc.). The environmental implications of FM are equally expected to increase dramatically. And, the ethical consequences of the above stand out as of importance. The anticipated increased need for services will probably lead to an increased pressure on wages and other work conditions; the technological development will most certainly lead to considerable privacy issues; the security issues will entail several concerns, such as the traceability, seriousness and reliability of actors involved; and FM-services are at the centre of contemporary debates on the balancing of work-intensive practices and capital investments.

### 1.1.5. Conclusions

The objective of EC Energy 2020 is to greatly improve the energy efficiency class in the existing building stock in the EU. According to the Buildings Performance Institute, up to 97.5% of existing buildings are still below efficiency A, therefore must be updated. This is a prerequisite for achieving the EC's 2050 goals for decarbonization.

Focusing on engaging citizens in formal and informal networks and groups for climate mitigation and adaptation, respond to the importance of social strategies to achieve change. Participating in climate groups and networks takes advantage of social norms, status, cooperation and competition. This may lead people to copy attitudes, behaviour and concrete measures (Hauge, et al., 2018). The motivational (Kobal, 2018) and socio-psychological theory in built environment (Temeljotov, 2005) is important for raising the willingness to change behaviour, so not only one mechanism, but the combination of different are relevant when addresses different social groups in the neighbourhoods /urban areas.

From the research it is seen that several mechanisms should be established to gain the target. All above mentioned ideas lead us to think broader to create innovative model of the future cities to become an ecosystem where various actors' long-term interests and business models are seen through the value creation. A new urban-ecosystem with the focus on the long-term citizen involvement in regeneration of built environment to co-create more open, wealthy and healthy urban areas. The scope is to develop a new model of open governance, value orientation and community engagement, with the aim that urban areas generate shared value for community, users and commercial actors over time, and to maximize the economic, social and environmental opportunities. An approach is also to reach this goal by designing space for increased interaction between people and smart technology.

The new role of Urban Facility Management for the implementation of knowledge in a broader urban context to contribute to the achievement of energy efficiency objectives is also highlighted. The role and concept of facility management should expand from typically business or public buildings to apply to the public, targeting urban neighbourhoods. A new Urban Facility Management role is seen as a position of knowledge, authority and trust in the urban community. Owners of urban areas will have access at the local level to research-based knowledge to implement energy efficiency upgrades.

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## 1.2. A space for making friends: The role of semi-private transitional space in stimulating social interaction in high-rise apartments

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### 1.2.1. Abstracts

Spatial characteristics of residential area can have an influence on, and in some cases define the content and form of social interactions (Kruse, 1974). In high-rise apartments, residents encounter many more co-residents, but have fewer friendships than ones in low-rises do (Gifford, 2007). Therefore, social interaction is more difficult for residents in high-rise building to regulate, which can lead to withdrawal, loss of community and social support. Previous studies have shown that the defects of high-rise buildings spring from the poor social quality of "intermediate spaces" that are criticized as weird, anonymous spaces (Dalziel, 2012; Modi, 2015). Intensive interaction can only develop in buildings where individuals are provided with appropriate 'secondary' territory or semi-private transitional spaces, which are spaces beyond an individual's primary or private territory (Altman, 1975). It is essential to provide a gentle transition from the front door of each apartment unit to the public space outside and to the upper floors of the building to stimulate encounters between residents (Dalziel, 2012; Maliki, 2014; Modi, 2015; Ghazli, 2016). This research aims to identify to what extent social interaction takes place between residents of high-rise apartments and determine how the design of semi-private transitional spaces stimulate social cohesion through intensification of social interaction. This paper conducts a comprehensive overview of interactional spaces and their characteristics in high-rise apartments. Furthermore, it will draw upon a literature review regarding the influence of relevant architectural characteristics of high-rise apartments, particularly of the semi-private transitional space, on social interaction.

**Keywords:** High-rise apartment, Informal meeting opportunities, Semi-private transitional spaces, Social interaction, Social cohesion, Stimulation



### 1.2.2. Introduction

There have been a lot of researches on social aspects of residential area in modern cities. These researches have appointed that social interaction is the most important factors of a community. Gehl, (1987) appeals that social interaction is considered as a pre-conditional to promote social cohesion. The capability to regulate interaction is essential for cultural and personal continuance, and if people could not figure out how to coordinate social interaction, their integrity of being human could be in danger (Altman, 1977). Regarding social interaction within the community, pre-conditions relating to the built environment can play a key role in inviting residents to stay longer outside their private territories and as a result, communicate with their fellow neighbors. The study of Mondada (2008) reveals that preconditions are sequences that “visibly and publicly assembled in time” and occur prior to social interaction. These sequences are the arrangement of mutual route where residents achieve social and spatial merging and coincidence.

For the past century, high-rise buildings have been considered suitable only for office and commercial purposes. However, due to spatial limitations, the city development pattern has turned from horizontal to vertical growth (Modi, 2015). Therefore, high-rise apartments form an important part of the housing stock in almost all large cities around the world, and as a common housing typology it presents challenges for investors, architects and urban planners. High-rise apartments often consists of repeating block, and are often designed with few characteristics elements. The mass-produced blocks often ignore the needs, personal backgrounds and lifestyle habits of their occupants (Hubbard, 2004). The uniform buildings have created different social and cultural problems, such as: social behavior, helplessness, poor social relations and hindered child development, etc. It is essential to provide a “group alteration of the environment” in high-rise, high-density residential to build community spirit amongst residents (Aw, 2016). There are many aspects that may influence the social interaction of occupants in high-rise apartments. Several researchers have examined relevant predictors for social interaction, and have different opinions about what factors are the most important. However, they all agree on the importance of the physical environment in stimulating social interaction. Projects on residential complexes often include a public domain, which open space is surrounded by facilities (Reijndorp, 1998). However, it is demonstrated that public spaces not belonging to a public realm are rarely used, while the smaller spaces around the home are intensively occupied by residents. When the neighborhood does not provide appropriate spaces for social interaction and casual neighboring, this can result in social isolation and general dissatisfaction with the whole area (Baum, 1978). In the design of new residential neighborhoods, one should seriously keep this problem in mind in order to develop a sustainable community. Therefore, high-rise apartments should consider the design of interactional spaces to encourage social interaction within the vertical neighborhood.

In high-rise apartments, the private territory is divided from the public territory (Aw, 2016). Semiprivate spaces can create a gentle transition and act as a threshold between private and public space (Baum, 1977; Birchall, 1988; Abu-Gazze, 1999). Without transitional spaces outside the unit, an apartment tends to keep people indoor and decreases the opportunity to communicate with neighbors (Maliki, 2014). A large number of studies focused on social interaction in the public shared spaces in residential areas. However, the design of collective spaces between the private and semi-public domains in high-rise apartments as interactional spaces is not widely studied.

This research will discuss the concept of social interaction and its relative importance in creating a cohesive neighborhood. Subsequently, an overview is given of characteristics of interactional spaces in high-rise apartments that fostering social interaction. Furthermore, it will draw upon the influence of relevant spatial characteristics of high-rise apartments, particularly of semi-private transitional spaces, on social interaction.

### 1.2.3. Social interaction in high-rise apartments

#### Concept of social interaction in relation to the built environment

Social interaction is a complex of activities that involve different dimensions of verbal and nonverbal communication in different contexts (Jaeghe, 2010), a reciprocal relationship between people in a group or community (Gehl, 1996), and frequently mediated by technology. It requires a certain timeframe, involves mutual and joint activities, presenting private or shared events at different timescales, and often resists against external interference (Jaeghe, 2010).

The level and nature of social interaction plays an important role in the formation of the spatial environment. Social interaction provides residents with information about their fellow neighbors and the social structure of the community. This in turn builds friendship patterns and social connection, and creates common rules of community (Pretty, 2001). The expected quality of social interaction in neighborhoods may differ, but the necessity to control social interaction is universal. The level of accessibility of interactional spaces can be controlled by a setting limits or instructed information. The outcome of this setting is keeping balance between resident's needs and desires and the achieved level of social interaction. If these two outcomes are not in balance, this can lead to social isolation or depression (Dorst, 2005).

#### **1.2.4. Factors that influence the process of social interaction in high-rise apartments**

##### **Factors most influences social interaction**

Previous studies reported different factors that can affect chance encounters and the continuity of social interaction between residents in a community. Fleming (1985) mentions three variables that can encourage social interaction in the neighborhood: opportunities for contact, proximity between dwellings, and availability of appropriate interactional spaces. Gifford (1997) mentioned four factors that can foster social interaction: personal characteristics, social factors, spatial factors and cultural factors. The characteristics of residential neighborhood were emphasized as a tremendous influence on social interaction that it can bring chances and as the same time delicate on who residents interact with and where the social interaction take place (Yance, 1971; Fischer, 1977). In another study: proximity, homogeneity, mutual interest and physical attractiveness are indicated as major variables that contribute to the success of social interaction (Aw, 2016). Different researchers have different opinions about what factors are the most important. However, they all agree on the relative importance of the physical environment for stimulating social interaction.

"Diversity, quality, accessibility and visibility of communal spaces and limited private space" (Jo, 2006) can be considered the keys design variables influencing social interaction. These design variables can create attractive spaces for social interaction and casual neighboring. Of particular interest in more recent literature is the study of Jo (2005), which designates the "division of space" and "circulatory systems" as the key design factors in promoting community participation and unity of neighborhood. Thus, enabling surveillance through community setting and spatial structure is important in promoting social interaction. Problems with design, such as a lack of surveillance opportunities through sequence of spaces, overcrowding, or a lack of semi-private space, can create a negative attitude towards the community and may result in complete withdrawal.

Literature shows that proximity greatly influences social cohesion in residential areas. Functional and physical proximity (Kuper, 1953), and others factors such as: the number of dwellings in a block, the number of dwellings sharing one entrance, the constellation of houses or apartments, and the building materials are considered important predictors for the success of social interaction (Gehl, 1987; Sengul, 1990. Abu - Ghazze, 1999). Altman's privacy theory (1977) emphasizes the negative impacts of density or proximity on neighboring. It was clearly appointed that different cultures have different norms or regulations of privacy which can control the accessibility of territory. If a certain level of privacy cannot be controlled or involuntarily encounters take place, social cohesion can be decreased within the neighborhood.

The importance of the physical environment, and the related design factors, are undeniable in promoting social interaction in the neighborhood. However, there are many others factors that also influence social interaction including personal characteristics, social factors, cultural background, etc.

Personal characteristics such as personality traits, interpersonal dynamics and attitudes (Clitheroe, 1998), which are largely influenced by people's background, partly decide the level of social interaction. Whether or not people are willing to spend their time to participate in social activities with neighbors, depends on how well or how dependence they are. However, residents mind can change regarding their experience of environment and people that they interact with. It is also important for residents to recognize where is the self or private zone before enter the interactional zone. Social factors, including social dynamic and the organization of a community (Jo, 2005), social characteristics of neighborhood (Shabazi, 2015) influence the availability of communal spaces and the way people interact with their neighbors. Socio-demographic factors, such as age, marital status, and income, also contribute to the success of social interaction (Shabazi, 2015).

A great number of scholars have mentioned the relative important of group size in fostering social interaction. The early research by Gehl, 1987 concluded that large groups result in anonymity. Later Bichall, 1988 agreed with this conclusion by emphasizing the contrary relation between the community size and the frequent use of shared space, the smaller the group the more inclination residents participate in communal activities. The followed studies such as those conducted by Fischer, 1977; Coleman, 1990; Fromm, 1991 and Glaeser 2012 also affirm that small group spaces can provide better opportunities for social and communal interaction.

### 1.2.5. The influence of culture in social interaction

“Cultural value shape society’s way of life” (Opoku, 2015) and the design of physical environment that satisfy the social needs of residents is considered as a solution to preserve social and cultural value (Woodcraft 2012; Berkeley-Group and UK-GBC 2012). Its aim is to protect social and spatial environment from modernization that lack of cultural relevance (Pomeroy 2014). Designers should seriously consider this relation by creating interactive spaces and appropriate environments that are not only protect resident’s privacy but also highlight their identity.

In different contexts, such as countries or cultures, the nature and level of desired social interaction will be different. In the Eastern countries, the nearby environment plays a more important role than in the West. While the desire level of privacy is similar, the social conventions are more crucial in Eastern culture where the immediate living environment is more important than in the West, the desire for privacy is the same, but the social conventions play a greater role (Altman, 1975). Here, we take a case in the city of Hanoi – Vietnam as an example. There is a mismatch between people’s demand for social interaction and the capability of providing appropriate spaces for interaction. The results of some sociological surveys in high-rise apartments in Hanoi have shown that the demand for social interaction is quite high, and that people desire to have a good relationship, even become close friends, with their neighbors (Tung, 2016). This need for high levels of social interaction originates from the traditional way of life in which the values of the community still following people in their continuous life when they migrate from rural areas to cities. People create their own place in urban life by bringing back social aspects of their former rural living environment. This mismatch between people’s social needs and the design of their urban living environment mostly occurred in the low and middle – income apartments in Hanoi where social relations are very important for human well-being (Khuat, 2017).



Figure 1: “Corridor party” in one of high-rise apartments in Hanoi

Source: <https://vnexpress.net/tin-tuc/cong-dong/nguoi-ha-noi-bay-tiec-giua-hanh-lang-chung-cu-gaybao-cong-dong-3299192.html> (accessed 25 June 2018)

Although high-rise apartment buildings has not appeared for a long time in Vietnam, according to some researchers, they also began to form part of its culture. Although the demand for community activities and social interaction has not been paid much attention by investors and designers, survey data collected in 2012 in four new urban areas in Hanoi showed that community relations between neighbors in these urban areas are quite strong, even for new residents (Khuat, 2017). However, this can be due to the inertia in the behavioral culture of the residents, who used to live in low-rise buildings, and brought their culture to high-rise

living. It is unlikely that this will stabilize and continue to exist in the future life of rural people who now live in high-rise apartment buildings. After all, new generations are born and raised here. If the design of high rise apartments does not sufficiently match with the social needs of residents (with a rural past), this can be possibly result in social isolation and loneliness among future generations of residents - "neither anywhere nor belonging to anywhere"

### **Spatial and physical factors that influence social interaction in high-rise apartments**

Abu-Ghazze (1999) concluded that spatial and physical factors of a neighborhood have not been paid much attention by previous studies, both as the setting of social relationships and social cohesion. The zoning of space is necessary in the design of interactional spaces, because zoning creates an interesting connection between the physical environment and social behavior (Canter, 1991). Residents tend to use public spaces when they are limited to small groups, the smaller the group the greater the number of people that are willing to participate in public activities and use public spaces (Birchall, 1988).

High-rise building cannot provide the same hierarchy of space like low-rise housing (Modi, 2015), which is considered the most important indicator for stimulating social interaction. Therefore, in order to develop a social sustainable community in this vertical neighborhood, it is essential to create a sequence of spaces which can promote surveillance and social interaction. This sequence of spaces should be distributed in all levels of the building, so that it can provide communication opportunities for residents of the whole neighborhood. Designers of high-rise apartments should also consider alternative design solutions regarding front gardens in landed houses that face the streets. This kind of semi-private spaces encompass a set of spaces, such as corridors, and elevator lobbies, to create sequence of space. The secondary space or intermediate space in high-rise apartments act as a transitional zone between the public and private territories. Without transitional space outside the door of each unit, the apartment tends to keep people inside their private zone and decrease chance for communication with their neighbors. The spaces outside their home become empty and disconnected. Previous studies also rose questions about the effectiveness of the communal facilities on the ground floor which were commonly designed in high-rise apartments. These spaces were considered to be large, anonymous, and open to all public (Birchall, 1988). Therefore, residents of the community are not inclined to use the space for social communication and preferred to stay in their own territory.

#### **1.2.6. Interactional spaces in high-rise apartments**

Scholars considered interactional space as a suitable space for contact (Higgs, 1980), group controlled semiprivate communication (Baum, 1978), and a meeting or communal space (Carr, 1992). Interactional space in high-rise buildings can provide appropriate areas for certain social activities, which are controlled by a certain group of people. This is referred to the concept of interactional territory by Lyman (1967). While Taylor (1980) and Brown (1987) considered a territorial community as whole neighborhood, Gehl (1987), Birchall (1988) and Glaeser (2012) concluded that small group spaces can foster better social and communal interaction. Furthermore, the provision of interactional space should not only consider a beautiful appearance and functional purpose, but also the residents' social needs and social cognitions.

Without the provision of communal spaces within the building, residents tend to withdraw from social activities as the design of the building creates crowd and reduce privacy. The idea of 'communicative' design is to raise resident's feelings of belonging and at the same time create a platform for residents to interact with their fellow neighbors. In high-rise apartments, most movement occurs along indoor hallways through corridors and elevators. For that reason, its format is not capable to provide appropriate social spaces, both physically and visually, while residents making their journey around their neighborhood. The hallways are normally anonymous and empty, and elevators and corridors act as the direct connection to the specific destination without experiencing social interaction (Modi, 2015). When the neighborhood provides inadequate social space that is required for social interaction, it is difficult to manage (chance) encounters. (Stokols, 1972; Baum, 1976). Furthermore, high-rise apartments also make it difficult for residents living in upper floors to go down and get out in open public space to participate. Therefore, social interaction can be reduced to near-home activities on the short term. It is essential for social interaction, that in apartment buildings alternative spaces are created for promoting encounters and developing quality of life.

The spatial arrangement of the physical environment may have an influence on specific aspects of behavior, and its quality can lead to negative or positive interaction among occupants (Tange, 1984). Residents in every culture are involved in the process of regulating social interaction – it could be accessible or inaccessible depend on different timescales and events. The ability to control who could access the interactional spaces depends on physical, psychological, and social elements of a certain cultural context (Altman, 1977). Mitchell suggested that the main issue to stimulate social interaction is the spatial organization just outside housing units and buildings (1971).

### 1.2.7. Semi-private transitional spaces

#### Concept of semi-private transitional spaces

Semi-private space is a space outside individual's primary or private territory in which the frequent use of residents reflects the characteristics of group territory (Baum, 1977), such as the buffer zone between private and public space (Birchall, 1988), circulatory systems such as corridors, lift lobbies and staircases, that can encourage occupants to get out of their 'walled' units, and use the access way as their intermediate or semi-private spaces (Maliki, 2014). This space is for common use by residents within the neighborhood, so they are not totally private. However, they're inaccessible to outsiders, and therefore they do not belong to public realms either.

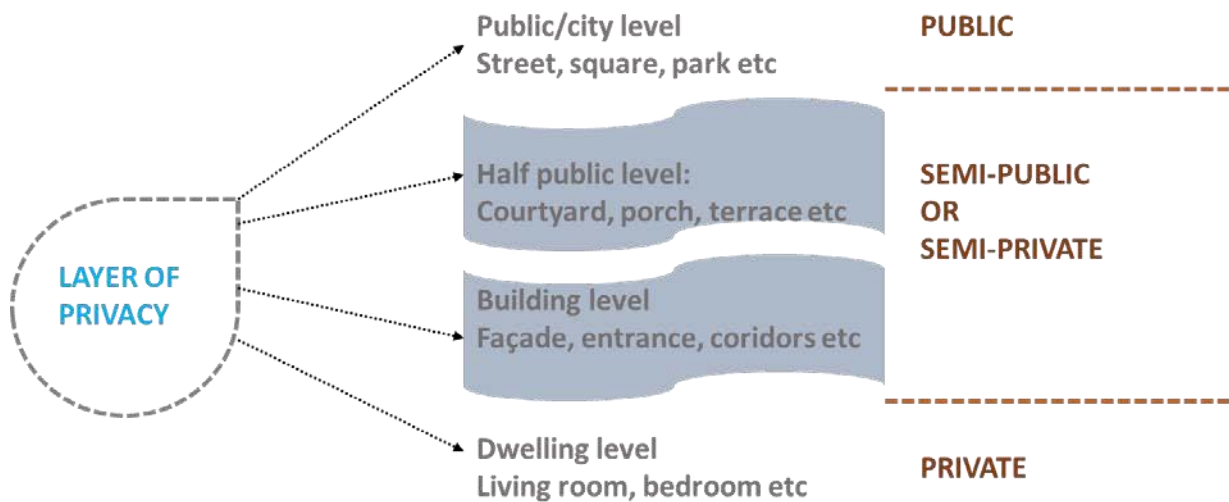


Figure 2: Layer of privacy that represents the transition between public and private space

Transitional areas represent spaces that could gently connect private home and public settings, such as the circulatory systems that one has to pass to reach and leave their own home (Sundstrom, 1977), spaces that are designed to encourage passage and eliminate meaningless, etc. Transitional areas also can act as excellent interactional spaces, with a potential for community communication with appropriate design consideration (Aw, 2016). Carolien Hoogland mentioned in her PhD thesis that transitional areas appear as spaces where private and public realms overlap and which can provide a communication platform between individuals and local community.

#### The role of semi-private transitional space in fostering social interaction

The near home community is the primary source of communication and recognition of common interest (Abu-Gazze, 1999), in which residents can contact their neighbors. In the near home community each household creates its own territory. At the same time it provides residents the platform for "tentative social feelers" (Taylor, 1985), and encourages residents to interact with each other (Abu-Gazze, 1999). Gifford (2007) points out that social interaction was discouraged in the nearby communities of high-rise apartments. However interaction between neighbors can be promoted by appropriate design solutions for these apartments.

The semi-private space is considered to be an excellent interactional space. It acts as a threshold that promotes surveillance to public space and increases informal meeting opportunities. At the same time it can

be used for formal activities in the neighborhood, such as meals and parties, etc. This type of space can eliminate crowds in the community, which may lead to withdrawal and discourages social interaction. The defects of high-rise housing typology is that it cannot provide appropriate semi-private space as the transition zone between public and private realm. This drawback is a challenge to be considered in the future design of high-rise apartment buildings, in order to promote chance encounter and social interaction.

Dovey (1985) indicated that public shared open spaces are declining overtime. Public domains make it difficult for residents to “enact personal or collective appropriations”. The loss of public shared space in the near-home territory leads to the significant decrease in the dialectics of home/journey and private/public. The home is the only private territory and security area; its boundary hardens; semiprivate space hidden, the informal use and supervision to public realms limited (Dovey, 1985). The establishment of the social and physical structure of public spaces at different levels, can regulate gentle transition from more public to more private spaces and make residents feel safe and strongly attached to the near home environment (Gehl, 1987). The neighborhood which causes a sense of belonging can extend beyond individual dwelling and therefore invite residents to stay longer in public spaces. Gehl also emphasizes that lingering in semi-private areas play a key role in fostering social interaction.

Intensive interaction between residents can only develop in buildings where individuals are provided with appropriate ‘secondary’ territory or semi-private transitional spaces, which are spaces beyond an individual's primary or private territory (Altman, 1975). Kisho Kurokawa (1994) emphasizes the importance of having a secondary zone in the building as a meaningful half-public or half-private space to occupants in the neighborhood. The provision of buffer zones (semi-private spaces) between private and public space can increase the threshold (Homans, 1968; Baum & Valins, 1977; Birchall, 1988) for fostering social interaction. These buffer zones gradually provide a transition between public and private domains (Abu-Gazzeh, 1999)

In an example of residents in Malaysia, where people migrated from rural villages to cities, the absence of a positive transitional space in their apartments had negative effects on their everyday life and their capability to adapt to urban setting (Maliki, 2014). The female migrants claimed that at the early stage of their lives in the new neighborhood they feel disconnected, alienated and isolated. Without the provision of intermediate spaces outside an apartment unit, the design and orientation of the ‘pigeonhole’ apartment tend to keep dwellers indoors, oblivious to things happening around them. Thus, denying them the opportunity to be outside and socialize with the people who live around them. The corridors outside their homes became a lifeless connector between boxes of living units. These rigid and inflexible physical environments of city living had a significant impact on the quality of life of the urban migrant housewives.



### 1.2.8. Conclusions & Discussion

#### Conclusion

Social spaces are better developed in the horizontal direction than in the vertical direction. However with their large footprints, vertical social connectors would be an interesting alternative. Previous studies on social cohesion indicate that people from all ages and cultures desire social interaction, as it is part of human nature. Therefore, high-rise apartments need to respond to these desires by “becoming social connectors themselves” (Jo, 2005), in which the potential of semi-private transitional spaces should be considered for stimulating chance encounters.

On the basis of the research findings, one can conclude that there are different factors that influence social interaction in high-rise apartments. However, the presence of hierarchy of space is considered to be the most important indicator. A well designed interactional space can attract more people and invite them to stay longer to communicate with their fellow neighbors. Future high-rise apartment projects should seriously consider the provision of hierarchy of spaces within its building through semi-private transitional space to increase surveillance. This sequence of space does not only allow residents to recognize opportunities in socializing, but also creates small social group spaces which can provide residents different selected options regarding their demands and interests. The importance of spatial characteristics and the hierarchy of spaces for influencing social interactions in semi-private transitional spaces in high-rise apartments needs to be further investigated.

#### Discussion

Vietnamese people say “A stranger nearby is better than a far-away relative” which clearly reflects the good tradition in the society, and emphasizes the importance of social interaction with neighbors. “Talk to me” is not only a basic need for elderly people, but also for people of all ages. However, with the current status of interactional space in the majority of residential areas, especially in high-rise, highdensity living, people tend to return to private apartments rather than interact with neighbors. Future research should take into account interactional conditions in the residential area, particularly in highrise apartments.

The tradition in community relations and social interaction with neighbors differs according to culture and context. However, the demand for community activities and social interaction are universal. A report from the United Nations (2015) shows that 54% of the world population lives in urban areas, and in 2050 this percentage is estimated to be around 66%. These statistics call for action worldwide. Future research should thoroughly examine the architecture of high-rise apartments, so that it can guide the social behavior of apartment dwellers in such a way that it matches urban civilized life.

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## 2. Climate Change

## 2.1. The Impact of Climate Change on the Strategic Management of River Dam Assets

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### 2.1.1. Introduction - Abstract

The purpose of this paper is to discuss the impact of Climate Change (CC) on the strategic management of River Dam Assets and to provide an overview of ongoing research related to this topic, particularly regarding the adaptation of these assets. Hence, the CC scenario accepted by the scientific community foresees severe, devastating alterations to the hydrological regimes of watercourses in the coming decades and their impacts on the environment and society, including river dams, which were not designed to meet these changes. So far, extensive climate data has been collected over the past 100 years. In this paper, relevant research data, findings, policies, legislation, impacts and consequences from EU member states are presented and interpreted through descriptive methods. Furthermore, relevant asset management research regarding the adaptation and mitigation of CC impacts and consequences on river dams is provided, including human relations to real estate regarding technical, social, psychological, historical and economic influence. Although extensive CC research has been demonstrated, only a small amount of research deals with the impacts of CC on dam safety including the management and adaptation of these assets. Well understood impacts of CC on river dam assets in correlation to adequate asset management policy can ensure effective adaptation of these assets to CC.

**Keywords:** Climate Change, Asset management, River Dam, Safety, mitigation measures, adaptation.

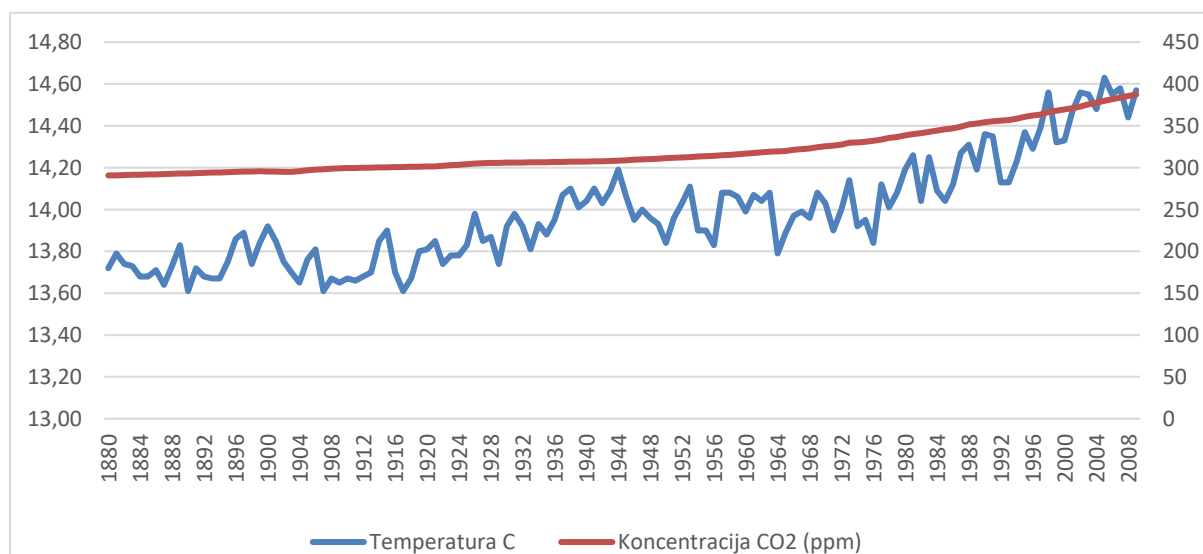
### 2.1.2. Purpose

The purpose of this review paper is to discuss the impact of Climate Change (CC) on the strategic management of River Dam Assets and to provide an overview of ongoing research related to this topic, particularly regarding the adaptation of these assets. Dams are critical infrastructures with a long design lifespan, typically lasting 100 years or more, and are, as such, not designed to meet future Extreme Weather Event (EWE) hydrological conditions, which were projected in the 2016 EEA/IPCC report. Reconstructing, in particular, the dimensions of spillways and gates to new hydrological requirements is costly and often impossible due to space limitations (Z.W. Kundzewicz, 2010). Therefore another cost-effective approach to mitigate the consequences of increased extreme discharges needs to be identified. The European Flood Directive (2007/60/EC) insists floods “cannot be prevented altogether” but must be managed “to reduce the risk of adverse consequences” when control failures inevitably occur (D.Dermit et.al, 2017). Furthermore, according to Directive (2007/60/EC), the principle of solidarity should be included in management practices focusing on prevention, protection and preparedness by giving rivers more space along the watercourse. Land management will, therefore, raise many concerns.

### A historical overview of Climate Change Research

To better understand the development and understanding of climate impact and CC impact, this paper includes a historical overview. We intend to demonstrate that it was engineers, geologists and physicists, many of whom were involved in the development of hydropower and dams, who contributed to a better understanding of the causes and impacts of CC. Unfortunately, the awareness among engineers regarding the contribution to combating CC is weak or non-existent. The first management approaches to dam management were related to the development of the first civilisations. They began to build the first dams and reservoirs for irrigation purposes in agriculture. Their main aim was the management of seasonal, climate-related conditions. They stored water and used it during the dry season to grow crops and feed livestock. This example shows one of the first adaptation measures to climate conditions (drought). Contemporary CC research dates back to the middle of the 18<sup>th</sup> century, when John Tyndall (1820-1893) constructed a hypothesis that Europe was covered by a thick layer of ice 10,000 years ago. In the year 1824, French physicist Joseph Fourier (1768-1830) began to use the term “Greenhouse gasses”.

*Figure 1: The relation between levels of atmospheric CO<sub>2</sub> concentrations and global average temperatures in the years 1880- 2008.*



He knew that it is the atmosphere that protects the Earth from the Sun’s radiation and concluded that the atmosphere could change and result in an effect similar to the effect of a greenhouse. 35 years later, J. Tyndall identified water vapour and CO<sub>2</sub> as causes, while S. Arrhenius (1859-1927) emphasised the relevance of CO<sub>2</sub>

and made the first calculations comparing the impact of the level of CO<sub>2</sub> emissions on global temperature. He calculated that a reduction in CO<sub>2</sub> emissions by half would cause a cooling of the Earth's atmosphere by 4-5 °C (a return to the ice age); at the same time, he was aware that that would only be possible if such changes in the atmosphere were possible. At that time, geologist Arvid Högbom (1857-1940) was finishing a report regarding the impacts of volcano outbreaks and CO<sub>2</sub> emissions in general and compared them to ocean absorption capability. He included emissions resulting from human activities, particularly emissions resulting from industrial processes (steam machines). It was the first time that human activities were non-intentionally associated with the cause of CC. In 1939, engineer and meteorologist Guy Callendar (1897-1967) linked global temperature data to the level of CO<sub>2</sub> in the atmosphere. Figure 1 includes this data for the past 150 years. It took scientists until 1957 to discover that oceans absorb much less CO<sub>2</sub> than initially anticipated. Despite evident proof that CO<sub>2</sub> is related to rising global temperatures, awareness of the consequences was almost non-existent. One year later, in 1958, C. D. Keeling (1928-2005) began regularly monitoring CO<sub>2</sub> concentrations. It took seven additional years for state authorities (e.g. U.S. Administration) to recognise that "CO<sub>2</sub> emissions present invisible pollution". Later on, in 1972, the first United Nations environmental conference was organised, paving the way for the establishment of the „Intergovernmental Panel on Climate Change (IPCC)“ in 1988. In 1997, 195 countries ratified the Kyoto accord and agreed to reduce GHG emissions by 20% by the year 2020 compared to the reference year 1990. Two years before the deadline, most countries had achieved this ambitious goal. In 2015 a new, more ambitious Paris accord in line with the latest findings was adopted, amending the Kyoto accord from the year 2020 on. Its primary goal is to establish a framework to limit the rise of global temperatures to much less than 2 °C and provide guidelines for the years 2030 and 2050; preventing and mitigating the devastating consequences of global warming.

### **The impacts and consequences of global warming**

The rise in awareness of the consequences of CC began after 1965 and is associated with the development of Non-Governmental Organisations (NGO) and Green movements. They paved paths to the development of green research, green policies, science and economics. Since then the global scientific community has agreed on the consequences and drafted several reports (conferences of Parties – COP). In this paper, we rely on the report of the European Environmental Agency (EEA) „Climate change, impacts and vulnerability in Europe 2016, An indicator-based report“ and the United Nations (UN). The reports conclude that humankind will face the consequences regardless of efforts made to mitigate them. However, if nothing is undertaken, the effects will become devastating. Figure 2 shows that we will witness a decrease in annual precipitation levels across significant parts of Europe, except central and northern regions. The amount of precipitation during summer will decrease across most parts of Europe, except northern parts. Countries in the north of Africa, along with the Mediterranean, Western and Eastern Europe will be particularly affected. EWE will intensify (flooding and droughts). According to projections by Hirabayashi et al. (2008), floods corresponding to a 100-year return period may become considerably more frequent and intense in Central Europe. A projected increase of 40–50% in small and medium flood discharges, an increase of 15% in 100-year floods by the year 2050 and up to a 30 - 40 % increase by the year 2100 are expected, while flooding discharges are expected to decrease in the countries of northern Europe and Russia.

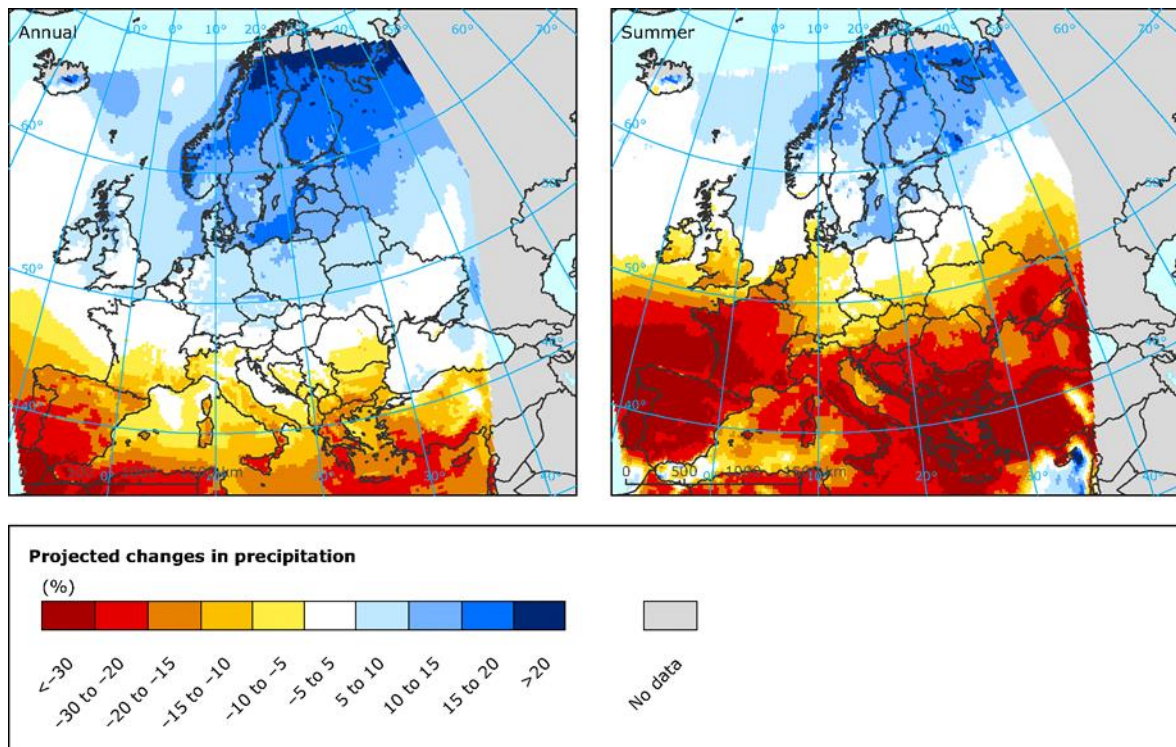


Figure 2: Projected annual and summer changes in precipitation in the period between 2070-2100, compared to the period between 1960-2015 (EEA)

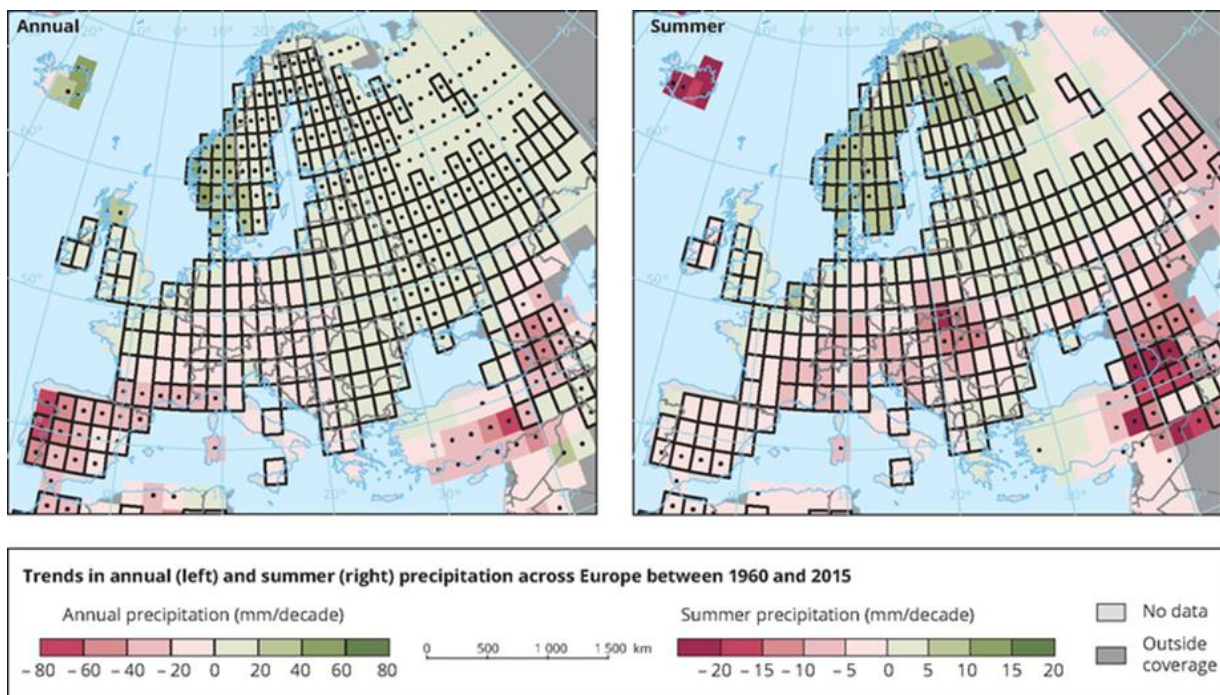


Figure 3: Trends in annual and summer precipitation across Europe between 1960 – 2015 (EEA)

Figure 3 shows past developments (generally a decrease in precipitation in mm/decade – marked in red) over the past 55 years. Considering average annual precipitation in countries on the Mediterranean coastline (varying from 200 – 600 mm/annum) and continental Europe (700-1000mm), the decrease has been significant, considering that summers are typically dry.

Based on the Paris agreement goals, the consequences of rising global temperatures will have impacts on political decision-making, climate change, the environment and society. Addressing and managing all these



consequences is crucial as they have a direct impact on river dams. Hence, impacts on the environment and society are addressed during the planning phase of the project in the Environmental and Social impact assessment study. Changes in global temperatures will result in interdependent changes, as according to [NASA](#) „Higher temperatures are worsening many types of disasters, including storms, heat waves, floods, and droughts. A warmer climate creates an atmosphere that can collect, retain, and drop more water, changing weather patterns in such a way that wet areas become wetter and dry areas drier”. According to researchers ([S. Lele et al. 2018](#)) understanding the impact of climate change on water has received enormous research attention in the past decade. Following the 2016 EEA report, the impacts and consequences of climate change will have an impact on the quality and way of life and will result in changes in land use, mainly as a result of the projected changes in the quantity and distribution of precipitation and the rise in global temperatures.

### **Adaptation strategies**

According to the 2001 IPCC Third Assessment Report definition „adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change”. Furthermore, according to the report, the adaptation significantly depends on the adaptive capacity or adaptability of an affected system, region, or community to cope with the impacts and risks of climate change”.

As a result, the EU has been systematically addressing vulnerability as a result of CC by introducing the White paper - Adapting to climate change in 2007 (EUR-Lex - 52009DC0147). The first phase took place between 2009 and 2012 and included actions such as building up a solid knowledge of the impact and consequences of CC, integrating adaptation into EU key policy areas, employing a combination of policy instruments and stepping up international collaboration on adaptation. The second phase began in 2013 and is ongoing. It focuses on three objectives: (1) the promotion of action by Member States (MS) by providing funding, (2) „climate proofing” action at the EU level and (3) better-informed decision making.

This paper focuses on „climate proofing”, which includes two types of response measures: (1) to reduce greenhouse gas emissions (GHG) and (2) adaptation actions to deal with the unavoidable impacts of CC. The EU Commission (COM(2013) 216 final ) identified vulnerable areas, among them:

- cross-Border management of floods,
- fostering collaborative agreements based on the EU Floods Directive;
- trans-boundary coastal management, with emphasis on densely populated deltas and coastal cities;
- mainstreaming adaptation into urban land use planning, building layouts and natural resources management;
- sustainable water management; combating desertification and forest fires in drought-prone areas.

These vulnerable areas impact, but are not limited to, sectors such as agriculture, energy and marine ecosystems. Extreme Climate Events (ECE) have enormous economic and social impacts. They affect: (1) infrastructure (buildings, transport, energy and water supply), (2) human, animal and plant health, (3) water resources and cause water stress. Furthermore, ECE will affect river and marine ecosystems, cause biodiversity loss and impact other ecosystem services, such as the provision of drinking water, food production, building materials and design standards. These changes will alter land use practices and planning decisions<sup>1</sup>.

### **2.1.3. Review of ongoing research**

This chapter includes an overview of ongoing research related to the impact of CC on the management of River dam assets. According to the study, CC will have an impact on the energy sector. Most of the ongoing hydropower research addresses two issues: (1) changes to hydrological regimes and their impact on power generation and (2) sedimentation, while the impact of CC on dam spillway capacity is rare (non-existent). Based on the investigation into dam failure causes and the evaluation of impact assessment requirements

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<sup>1</sup> In 2016, the Commission launched an evaluation of the EU Adaptation Strategy to examine the actual implementation and performance of the strategy. The evaluation is planned to be completed by the end of 2018,

during the planning phase of standard HPP projects, we have identified crucial areas to be considered and included in mitigation approaches.

### **Causes and consequences of dam failure and dam management findings**

Existing guidelines, manuals and standards are based on analysis of statistical data. According to the US Federal Energy Regulatory Commission (FERC), most failures are consequences of overtopping and flooding (35%), foundation damage (30%), piping (20%) as well as damage to intake and outtake structures (10%). The reasons are suggested physical factors, such as inadequate spillway design/blockage, differential settlement, erosion and so forth. New research emphasises the importance of understanding human factors and explains the reasons for its absence, e.g. the technical background and orientation of engineers (I.A.Aliwi, 2015). Communication inclusion tools, such as the IHA Sustainability protocol, may help identify a variety of stakeholders including those outside the hydropower sector (S. Eichert, 2014, p.188) but alone do not manage and provide an understanding of human factors nor correlate them to physical ones. The authors A. S., D. J. Vanier, T. Froese (2012) emphasise the importance of assessing, maintaining, upgrading or sustainably replacing these assets to ensure the low risk and profitable operation of a HPP's structures. Furthermore, managing and monitoring external impacts (e.g. climate change) and predicting the performance of ageing Infrastructure Assets are essential to future research (A. K. Parlikad, M. Jafari, 2016). HPP specific research, regarding the impact of CC on dam management and safety as well as the impact of reservoirs and climate, has been carried out in the past, demonstrating significant changes and the need for adaptation. Research findings include, but are not limited to, water policies, biotic diversity, management of existing and new dams (J. Pittock, 2010), and dam safety as a result of changed hydrological conditions (H.H. Chernet, K. Alfredsen, G.H. Midtomme, 2014). Not only has the impact of climate change on dams been addressed, but also the impacts of large dams on surrounding climate and precipitation patterns (A. M. Degu et al., 2011).

### **Environmental Impact (Post) Assessment**

The evaluation and assessment of the impacts of infrastructural/engineering projects that are likely to have a significant impact on the environment is a relatively new discipline dating back to 1985, when the first directive was adopted (The EIA Directive 85/337/EEC). Environmental management has since then gained recognition and in-depth understanding of the nature and scale of the implication of environmental change brought about by human actions (R.K.Morgan, 2011). Since then, it has been amended three times: (1) increasing the types of projects covered, (2) involving and including different audiences in the Aarhus convention and (3) addressing the transport, capture and storage of CO<sub>2</sub> (e-source). In recent years, post-disaster and climate change impact assessment has generated many new challenges dealing with the broader implications of climate change adaptation strategies. Furthermore, recent reviews of the Environmental Impact Assessment Directive (EIAD) have shown that the existing EIA does not adequately cover environmental issues, such as climate change, biodiversity, use of natural resources and disaster risks (SWD 012 354 final). After the completion of infrastructure projects, an Environmental Impact Post Assessment (EIPA) study can be carried out, comparing results to the EIA study. According to the authors Q.G.Wang et al., (2012) dam and reservoir EIPA studies, if conducted, focus on water temperature, aquatic life, terrestrial life hydrological regimes, environmental geology, landscape and heritage, and resettlement. However it is seldom the case, even though these sectors are most prone to the impacts and consequences of CC.

### **Asset management practices**

Infrastructure Asset Management is a part of Asset Management and is a relatively new scientific discipline, whose beginnings are not well known. It began developing in parallel across the globe in Anglo-Saxon countries; the term was first used in a document from the »United States Department of Transportation» in 1983, and later by Dr. Penny Burns in 1984 (e-vir)<sup>2</sup>. In the UK, the development of Asset Management was associated with the privatisation of Water and Municipal infrastructures during the economic crisis of the 1980's during the Government of Prime Minister Margaret Thatcher (1925-2013), according to Too E. in Tay L. (2008). In Australia, the term was introduced to the field of public services and works in 1993 with the adoption of the Australian Accountant Standard - AAS27. It set requirements for public authorities to present the condition of their physical assets as a combination of depreciation and capitalisation, contrary to existing



practice as a combination of costs and income. Nevertheless, it took until 2004 to adopt a definition of the term “Asset Management” based on the ISO 55000 standard. The following definition was set: *“the coordinated activity of an organisation to realise value from assets”*, where an asset is an *“item, thing or entity that has a potential or actual value to an organisation”*. The realization of value will typically involve a balancing of costs, risks, opportunities and performance benefits, while activity has a broader meaning and can include, for example, the approach, the planning, the plans and their implementation.

Professional Organisations have recognised Asset Management tools beyond the extension of maintenance. According to the Asset Management – An anatomy (IAM, 2015) definition, it enables observation developments of trends:

- From tactical to strategic (e.g. from the decision to excavate river sediments to lifecycle management),
- from isolated life phases and functional disciplines to a full lifecycle view (e.g. adapting infrastructure to future challenges),
- from individual assets to asset systems and systems of systems (e.g. each dam, a chain of dams within the administrative area, the system of dam chains along the entire watercourse) and
- from the management of discrete activity types to integrated management systems (e.g. the management of sedimentation issues and consequences along the entire watercourse).

The prerequisite requirements to understand the behaviour of physical assets require in-depth understanding throughout their entire life-cycle: how they are created, operated, maintained and replaced. Factors that impact include:

- Assets and systems are complex and often interdependent (making it challenging to draw a boundary diagram and failures often cascade, e.g. dam failure may cause dam failure downstream),
- asset system behaviour is dynamic and may change rapidly (e.g. dynamic changes in power generation in line with their needs),
- Asset lifetimes vary from a few years (e.g. hard and software) to hundreds of years (e.g. concrete structures), even within one system,
- Assets are voiceless; they must be monitored, analysed and diagnosed, and
- assets are technical; requiring an understanding of the material world and a foundation in science and engineering.

Also, ISO 55000 raises questions and concerns that cannot be answered based only on an understanding of fundamental engineering/technical knowledge and include:

- How to understand the nature and value of various stakeholder groups,
- Understanding how value is delivered,
- How to bring together the views and contributions of different activities to maximise value,
- Managing internal competition for resources,
- Developing rules for decisions based on risk tolerability and opportunity enhancement, and
- How to thoroughly integrate assets into the value chain, thus overcoming frequently held views that assets are an overhead, somehow ancillary to the enterprise, rather than a core contributor to organisational value.

These challenges were first systematically addressed within the area of the water infrastructure sector in the US, analysing ageing equipment, the reliability of operation and cost effectiveness of investments, triggered by the economic crisis (Zurich, 2017, page 9). Due to the importance, cost and nature the infrastructure is typically state-owned. Therefore, research in the form of manuals and papers mainly originates from infrastructure managers and governmental agencies. According to researchers (Too E. in Tay L. 2008) there is a lack of “fundamental theoretical and empirical research”, mainly as a result of a lack of interest and awareness among researchers. The authors Hale P.D. et, al. (2008) addressed ageing public infrastructure and the need for a robust management system to include various stakeholders and audiences. Camacho A.E. (2009) identified the need to establish a mechanism that would enable the efficient adaptation of infrastructure to CC

and acknowledges that the issue is not adequately addressed by legislators or scientists. Later that year the authors Kundzewicz, Z W et al. (2009) concluded that CC will have consequences to existing water infrastructure management practices, as they were designed and built as hydrological regimes that would not change. The authors Sitzbee E.W in Harnly. T.M (2013) addressed challenges related to the increasing cost of ageing infrastructure and the need for the establishment of a robust cost management mechanism. In 2015, the Department of Homeland Security Office of Infrastructure Protection published the »Dam Sector Crisis management handbook 2015« with guidelines that prevent or mitigate the occurrence of damage to and failures of dams, emphasising new dangers, terrorism and intentional damage (sabotage). As a result of the penetration of new renewables backed by subsidies (particularly feed-in tariffs), the authors N. Rouge in O. Bernard (2016) emphasise the impacts of low electricity market prices on dam safety.

#### **2.1.4. Legislative and professional frameworks**

According to the ICOLD Club Europe's analysis of more than 400 operating hydroelectric dams, most legislation and frameworks addressing dams address challenges until the completion of construction work. The legislation and management requirements during the operational phase are typically very loose and dependant on the operator. New conditions and changes result from other areas' policies that have cross-sectoral impacts, such as on ecology, biodiversity and the environment in general.

##### **Water policy**

Adopted European water policies based on the Water Framework Directive (2000/60/EC) aim to improve water management. Their primary objective is to understand and integrate all aspects of the water environment (N. Voulvoulis et al. 2017, according to Teodosiu et al. 2003), particularly knowledge of catchments. Although adopted 15 years ago, the authors identified challenges in implementation, particularly as only 10 % of surface waters improved and reached a good ecological status by the end of the first target period in 2015, while 47 % of EU water surfaces have not. The causes are strongly related to River Basin management, as it requires an in-depth, interdisciplinary, integral and holistic understanding of human activity and interaction with the environment (Voulvoulis, 2012).

The Flood Directive (2007/60/EC) was adopted seven years later, setting a legal framework to ensure flood protection and to evaluate flood-related risks and their occurrence. The consequences of CC cause flooding. Therefore, the Directive includes a principle of solidarity, encouraging Member States (MS) to share fairly responsibility on common actions needed to combat and manage flooding along watercourses. (Direktiva 2007/60/ES). Primary mitigation measures include (1) preservation of wetlands and flood areas, (2) financial mechanisms, such as adequate insurance of assets and solidarity among member states.

##### **Spatial planning and management**

According to the Slovenian spatial planning act (ZUREP-2, 2018), striving to achieve sustainable spatial planning and management is the key principle of spatial development, through holistically balancing social, environmental and economical aspects. The EU has recognised adaptation measures to the impacts and consequences of CC as a key target of regional development (EC, COM(2009) 147 final.). The authors A. C. Hurlimann in Alan P. March (2012) conclude that spatial planning is the tool for adaptation to CC impacting: (1) matters of community importance, (2) managing diverse interests, (3) addressing cross-sectorial challenges, (4) reducing and resolving indeterminacy, (5) acting as a catalyst for knowledge and findings, as well as (6) determining solutions for the future addressing of different subsystems. Managing different spatial needs as a result of the impacts and consequences of CC address: (1) development of awareness, (2) support to develop processes to achieve results, (3) redesigning existing processes by switching from passive observation to proactive involvement. The latter is significant due to increasing damage resulting from meteorological disasters and therefore has to be considered and included into the design process (P. S. Thomé in J. Klein, 2011). The authors conclude that adaptation to CC is the most common approach to combating them, contrary to giving way and creating space.

##### **Attitude to Real estate**

In Europe, people generally associate the term real estate (immovable property) to residential and commercial buildings, and rarely with infrastructure, which is inseparably connected and enables their functionality. Beside

a basic understanding and public awareness of the services that municipal public infrastructure (e.g. water supply, water treatment, transportation infrastructure, energy distribution infrastructure) provides, the perception of more complex water infrastructure among the general public is somewhat limited causing strong opposition during the planning and design phase. The complexity and importance of water infrastructure resonate in special regulations (e.g. in Slovenia in the rules laying down water infrastructure UI. RS. 46/05, in the Holland Act of 29<sup>th</sup> January 2009). However, no legal act addresses human relations to real estate. Today, we know that human relations to real estate are dependent on psychological attitudes. One of the most critical research questions related to psychological, environmental studies addresses the interaction between the individual and the environment. (A. T. Salaj according to Piaget, 2006, p. 15). Two processes related to the physical environment are assimilation and accommodation, where assimilation is an adjustment of the environment and accommodation an adjustment of the individual to the physical environment. Environmental studies address the impact of various environments on social behaviour, particularly on the changes they cause (A. T. Salaj 2006, str. 16). The decision-making model addresses the interaction between humans and the environment, setting questions needed to evaluate the benefits among options (Rus, 1997), assuming equality in relationships (options). Further elaborating on this, the management and adjustment of the relationships-options due to the impact of CC, as a result of the inconsequent implementation of spatial planning policy, and the emotional connection of the inhabitants to the real estate (property) will set many new challenges.

#### **2.1.5. Research limitation**

Research limitations are related to the nature of impacts. The impacts and consequences of CC are addressed considering verified CC scenarios. Based on existing knowledge, only the known consequences are being monitored and compared to the identified impacts. Ongoing research is directed at findings related to the erection of measures retaining or redirecting consequences, while new research paradigms, backed by EU directives, emphasize the importance of giving space (e.g. WFD, FD wetlands, flood areas) - retreating from the inevitable.

As previously elaborated on, the existing applied approach foresees that: (1) impacts do not change during the lifespan and (2) are already addressed and solved during the design phase. To shift to a new, recently developed paradigm, as discussed above, a new approach, the implementation of the relatively new discipline of »Asset Management«, shall be implemented. It will enable the management of various legal frameworks and legal and spatial culture influenced by historical development, which, as a result of the consequences of CC, impact the relationships between people and infrastructure.

As shown in the overview of existing research areas, we have identified crucial areas to combat CC. The areas were analysed and a synthesis of the research results was drafted based on the Report of the EEA and enlightening on the extent of the consequences of CC. Those were compared with the statistically analysed causes of dam failures. When reviewing, the following limitations were observed: (1) a lack of awareness among researchers regarding the impact of CC on dams, (2) a lack of long-term spatial planning including analysis of future needs (3) incomplete strategical research of the discipline of Asset Management (4) incomplete understanding of the relationships of various real states, in particular the impact of infrastructures on the environment. The existing partial understanding of the causes and consequences presents the main obstacle to the research.

#### **2.1.6. Conclusion**

River dams are structures that, once erected, cannot be physically altered without significant costs and consequences for the impacted area. Their impact, as a result of CC, sets an unprecedented and unpredictable threat. The extent of the consequences is subject to interdisciplinary research (e.g. defence sector, spatial planning, nature protection, agriculture). The need for further research was identified by authors, among them Too E. in Tay L. 2008, W. Kundzewitz (2009) etc.

An overview of the existing research enables further research in the direction of the holistic lifecycle management of river dams. Furthermore, it shall allow the detection of impacts and the determination of

necessary adaptation measures, as well as the preservation of the existing safety of river dams and their surrounding areas.

The research questions investigating river dams, which we shall direct research towards, provide answers to issues related to: (1) detection of the impacts of CC, (2) identification of synergetic consequences, (3) identification of remediation measures to cause as few as possible conflicts to space, the environment and stakeholders (4) evaluation of attitudes of different stakeholders to real-estate, (5) cross-border collaboration based on the principle of solidarity .

The research questions posed emphasise the need for further research, as no answers/solutions were found in foreign or domestic research works.

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## 2.2. The association between pro-environmental behavior and subjective well-being

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### 2.2.1. Abstract

The association between pro-environmental behavior and subjective well-being is a complex issue that is still not fully apprehended. In the paper we first systematically reviewed Eurostat (2017a) reports on energy, transport and environment indicators and identify two main categories of pro-environmental behavior: green purchases and good citizenship. Second, with the method of systematic review we also analyzed the OECD (2017) reports on well-being and extracted two dimensions: environmental quality as indicator of pro-environmental behavior and subjective well-being. Third, with the analysis of raw data of OECD (2017) we found out that Slovenians express higher dimensions of pro-environmental behavior than subjective well-being. Since our study is one of the first which is focused on particular dimension of well-being, that is subjective well-being, the results need to be interpreted with a caution.

**Keywords:** Pro-environmental behavior, Subjective well-being, Systematic review, Environmental quality



### 2.2.2. Introduction

#### Pro-environmental behavior

Almost every behavior performed by people in the developed world has an impact on environment (Gardner & Stern, 2002). General adoption of more environmentally friendly behaviors can have a major impact on reducing environmental impact (Clayton et al., 2015; Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009; Gardner & Stern, 2008).

Research on pro-environmental behavior (Pisano & Lubell, 2017) typically focuses on the frequency with which individuals engage in specific types of behavior, for instance, recycling or energy use. The literature on environmental behavior is traditionally divided into two major streams: studies focused on sociodemographic factors associated with environmentalism and studies on values, beliefs and other social-psychological constructs related to environmentalism.

Most existing research on pro-environmental behavior attributes has focused on:

1. Energy experts' conceptualizations about the cost, frequency of action, and environmental impact of one class of pro-environmental behavior: household behaviors that contribute to greenhouse gas emissions reductions (Dietz et al., 2009; Gardner and Stern, 2008; Laitner, Erhardt-Martinez, & McKinney, 2009).
2. Household energy behaviors, such as waste-reduction, recycling, domestic energy conservation, and activism (Karp, 1996; Stern, 2000; Whitmarsh & O'Neill, 2010), waste-reduction, advocacy, consumer behavior, and recycling.

Pisano and Lubell (2017) divide pro-environmental behavior into 5 domains: purchase of household goods, use of household goods, consumerism, waste disposal and activism. That means that behaviors varied in terms of cost, frequency of performance, and environmental impact within each of the following behavioral domains: activism, transportation, eating, efficiency upgrades, curtailment, weatherization, waste reduction, and water conservation. Actions are classified into three broad categories of pro-environmental behavior:

1. Green purchases, which mean the purchase of recycled goods or non-toxic substances,
2. Good citizenship, that is the minimization of energy consumption, water conservation, along with the reduction of waste production and promotion of recycling, and
3. Environmental activism, which includes environmental group membership.

Each of these categories consists of three factors, namely: sociodemographic factors, personality traits and attitudes toward the environment.

a) Sociodemographic factors. Pro-environmental behavior is shown to be related to gender, age, income, family composition, and whether the individual lives in an urban or a rural area. On average, women, older people, and people in higher social classes are more likely to engage in environmentally friendly behavior than are men, younger people, and people in lower social classes (Gifford & Nilsson, 2014).

b) Personality traits. Many studies have investigated the extent to which the Big Five personality traits (Costa & McCrae, 1992) are associated with environmental behavior. These studies have identified openness to experience and also, to a lesser extent, agreeableness and conscientiousness as drivers for pro-environmental engagement and behavior (Gifford & Nilsson, 2014). Barr (2007) also notes that individuals who are more altruistic and feel closer to nature are likely to act more pro-environmentally.

Another factor that has been studied is the individual's locus of control, referring to the extent to which people attribute control over events in life more to themselves (internal) or to factors outside themselves (external). It has been shown that having an internal locus of control is more conducive to behaving in an environmentally friendly way (Fielding & Head, 2012; Gifford & Nilsson, 2014). To behave in a pro-environmental way, individuals need to believe that their actions can make a difference.

c) Environmental attitudes, concerns and values. Gifford and Nilsson (2014) review the literature addressing the link between how people think about the environment and observed or self-reported pro-environmental behavior. Two of the determinants of individuals' choices to act in an environmentally sustainable way are environmental concern and awareness/knowledge about environmental problems. Environmental concern has been associated with reporting to act more pro-environmentally, yet the correlation between concern and actual behavior is not strong (Steg & Vlek, 2009). Hines, Hungerford, and Tomera (1987) identify knowledge of environmental problems as the most important predictor for pro-environmental behavior. One is unlikely to act in an environmentally sustainable way if one is unaware of environmental problems and of the possible actions that might lead to more environmentally sustainable behavior (Bleys, Defloor, & Van Ootegem, 2018).

### **Subjective well-being and pro-environmental behavior**

Various individuals, institutions, research projects, and disciplines have developed distinct definitions of well-being to serve a range of contexts and purposes (Ryan & Deci, 2001; Millennium Ecosystem Assessment, 2005; MacKerron, 2011). In psychology, subjective well-being is defined as a person's cognitive and affective evaluations of his or her life (Diener, 2000). It consists of two forms: cognitive and emotional one. Cognitive form of subjective well-being refers to person's life satisfaction in global as well as in domain terms, such as work, relationships etc. The affective form refers to emotions, moods and feelings. Affect is considered positive when the emotions, moods and feelings experienced are pleasant. Affect is deemed negative, though, when the emotions, moods and feelings experienced are unpleasant (Diener, 2000). Subjective well-being could be measured with two questionnaires. Life satisfaction can be measured using a questionnaire such as the 5 item satisfaction with life questionnaire (Diener, Emmons, Larsen & Griffin, 1985). Affectivity can be measured by for example, the PANAS (positive affect negative affect schedule) (Grum & Kobal Grum, 2015; Watson, Clark & Tellegan, 1988).

According to OECD (2017), subjective well-being is one of the 11 dimensions of global well-being. The latter consists of: housing, income and wealth, jobs and earnings, social connections, education and skills, environmental quality, civic engagement and governance, health status, subjective well-being, personal security and work life balance. The model of global well-being is presented in Figure 1.



*Figure 1: OECD model of global well-being (OECD, 2017)*

There were just a few studies dealing with subjective well-being and pro-environmental behavior. For example, Jacob, Jovic and Brinkerhoff (2009) published an article about the relationship between ecologically sustainable behavior and subjective well-being. They found out that relationship between ecologically sustainable behavior and subjective well-being is a sense of commitment to the ideals of ecological sustainability. The second article which is interesting for our study was published in 2014. Agarwala et al. (2014) assessed the relationship between human well-being and ecosystem services and identified three impacts of environmental change on the well-being: the importance of interdisciplinary consideration of well-being, the need for frameworks that integrate subjective and objective aspects of well-being and the central importance of context and relational aspects of well-being.

On account of the lack of strong empirical research on pro-environmental behavior in association with subjective well-being we designed our own study. The main problem of the study is to find out the establish the association between different domains of pro-environment behaviour and subjective well-being in Slovenia and other OECD countries.

We aimed to answer the following questions in this project:

1. How Slovenians, comparing with other OECD countries, behave in accordance to environmental issues?
2. Have their pro-environmental behaviour changed in past 10 years?
3. Is their environmental behaviour in any association with their subjective-well-being?

### 2.2.3. Method

#### Participants

The participants data of our study are part of the analysis which is based on the 2017 version of the Eurostat monitoring report on progress in an EU context (2017b). Eurostat has a policy of encouraging free re-use of its data, both for non-commercial and commercial purposes.

The data presented in this report were mainly extracted in late October 2017. Most of the data used to compile the indicators stem from the standard Eurostat collection of statistics through the European Statistical System, but a number of other data sources have also been used, including other European Commission services, the European Environment Agency, the European Institute for Gender Equality, the OECD, the World Bank and others.

The second data base was the survey from EUROSTAT publication Energy, transport and environment indicators (EUROSTAT, 2017a).

#### Procedure and measures

The procedure of methodology was done in two steps.

First step:

We systematically reviewed the following Eurostat and OECD publications:

- Eurostat (2017a). Energy, transport and environment indicators - 2017 edition. Luxembourg: Publications Office of the European Union
- Eurostat (2017b). Sustainable Development in the European Union — Monitoring report on progress towards the SDGs in an EU context. Luxembourg: Publications Office of the European Union.
- OECD (2017), How's Life? 2017: Measuring Well-being, OECD Publishing, Paris

Second step:

We systematically selected only those findings from OECD and Eurostat publications that fitted in Pisano and Lubell (2017) categorization of pro-environmental behaviors, such as:

- a) Green purchases,
- b) Good citizenship and
- c) Environmental activism.

### 2.2.4. Results and discussion

#### Results of systematic review and selection of pro-environmental behavior

The results in Table 1 show that only Eurostat (2017a) corresponds with Pisano and Lubell (2017) categorization. The category – green purchases fits with Eurostat results on environment, namely on: a) waste generation and b) waste treatment. The category – good citizenship corresponds with Eurostat results on energy and on transport: a) energy consumption, b) number of passenger cars, c) new passenger cars with alternative fuel engine, and d) modal split of inland passengers transport. For the third category – environmental activism, we didn't find any matches with Eurostat (2017a) results.

| <i>Proenvironmental categories (Pisano &amp; Lubel, 2017)</i> | EUROSTAT results on energy | EUROSTAT results on transport                                                                                                          | EUROSTAT results on environment                             |
|---------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Green purchases                                               |                            |                                                                                                                                        | Waste generation 2004-2014<br><br>Waste treatment recycling |
| Good citizenship                                              | Energy consumption         | Number of passenger cars<br><br>New passenger cars with alternative fuel engine<br><br>Modal split of inland passengers transport 2014 |                                                             |
| Environmental activism                                        |                            |                                                                                                                                        |                                                             |

We found that some of the results of OECD (2107) publication correspond to subjective well-being.

#### **Results on pro-environmental behavior - green purchases**

As stated, results on green purchases correspond to waste generation and waste treatment. Eurostat (2017a) published the results for 28 EU countries. In 2014, the total waste generated in the EU-28 by all economic activities and households amounted to 2 503 million tons; this was the highest amount recorded for the EU-28 during the period 2004-2014. In 2014, the highest quantities of waste, measured in kg per inhabitant were generated in Bulgaria (24 872 kg per inhabitant) and the lowest in Croatia (879 kg per inhabitant). EU average was 4931 kg per inhabitant. Slovenia reached the result of 2273 kg per inhabitant which places it below the EU average.

As regarded to waste treatment, 2 320 million tons of waste were treated in the EU-28 in 2014. Significant differences were found among the EU Member States concerning the use they made of various treatment methods. For instance, some Member States had very high recycling rates (Italy and Belgium), while others favored landfill (Bulgaria, Romania, Greece, Sweden and Finland). Average percentage in EU was 36,2%, which means that Slovenia ranked above EU average when it comes to waste treatment method, such as recycling.

#### **Results on pro-environmental behavior – good citizenship**

Figure 2 shows the energy consumption per GDP in 2015 in EU countries. Slovenia belongs to the countries with moderate energy consumption.

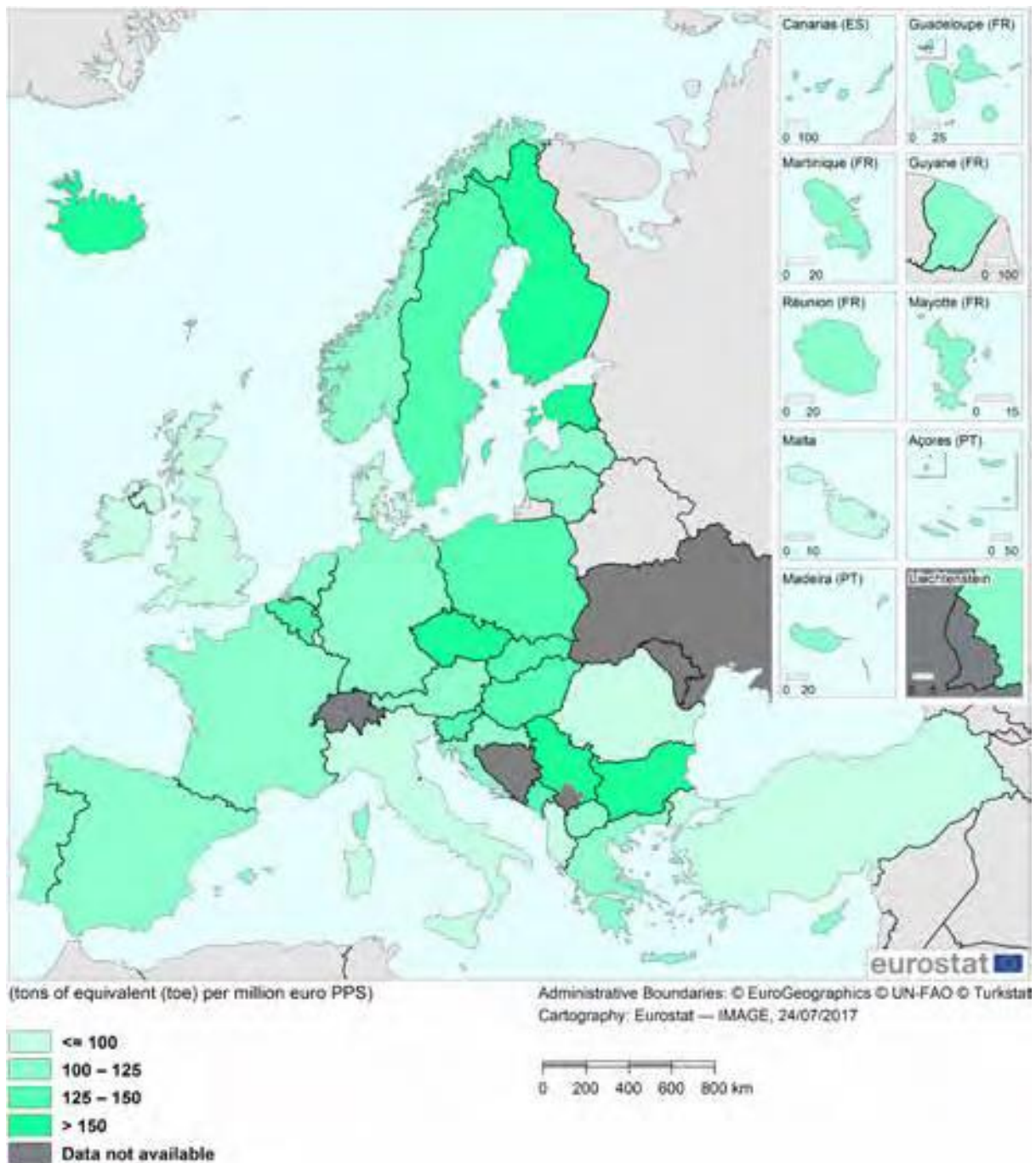


Figure 2: Energy consumption per GDP, 2015 (Eurostat, 2017a)

First match of good citizenship with pro-environmental behavior - energy consumption, shows, that oil continues to be the most important energy source for the European economy, despite the long-term downward trend, while natural gas remains the second most important energy source (Eurostat, 2017a). Only in three EU countries the share of fossil fuels in gross inland energy consumption is below 50 % - Slovenia is not in that group. Eurostat results from the year 2015 show that Slovenians use more passenger cars and more motor coaches and busses for transport than EU average of 28 countries, but much less trains. Slovenia also belongs to the countries that the use of new passenger cars with alternative fuel engine is among the lowest (Eurostat, 2017a).



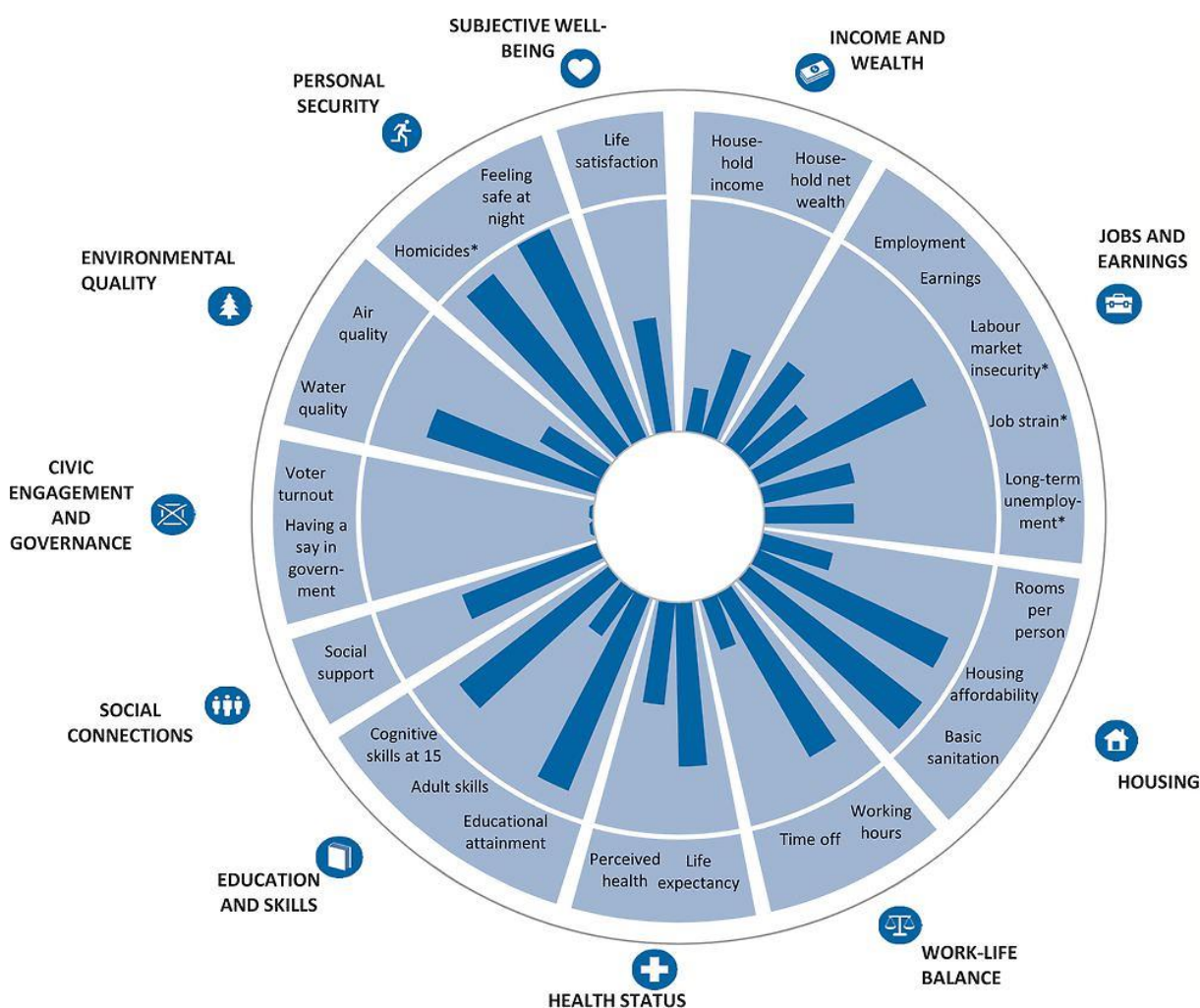
### Results of systematic review and selection of subjective well-being

After the review and extraction of pro-environmental behavior patterns from the Eurostat (2017a) results we completed the review and extraction of subjective well-being indicators as were measured by OECD (2017). The reason of that procedure was to find the answer on the third research question in our study: Is the environmental behaviour of Slovenians related to their subjective-well-being?

We reviewed the publication *How's life? Measuring well-being*, which was published in 2017 by OECD Publishing (OECD, 2017). As mentioned, the study defines well-being to be consisted of the following 11 factors: housing, income and wealth, jobs and earnings, social connections, education and skills, environmental quality, civic engagement and governance, health status, subjective well-being, personal security and work life balance. We were focused on two dimensions of global well-being: subjective well-being and satisfaction with environmental quality. We found out that the latter could be the best indicator of pro-environmental behavior. The awareness and care of environmental quality could be a significant step towards pro-environmental behavior. We extracted the results in 4 sections.

First section of the results is narrowed to environmental quality satisfaction. Analyzing the raw data of OECD (2017) we found out that Slovenians express higher environmental quality satisfaction than OECD average. The results could suggest that Slovenians are aware of their active role in the environmental quality and they express the pro-environmental behavior through the care for water and air quality. According to OECD report (OECD, 2017)

Second section of the results shows that subjective well-being is among the lowest indicators of well-being (Figure 3). That means that compare to rather improved conditions, such as: housing, education and skills, personal security and some other, Slovenians express lower subjective well-being.

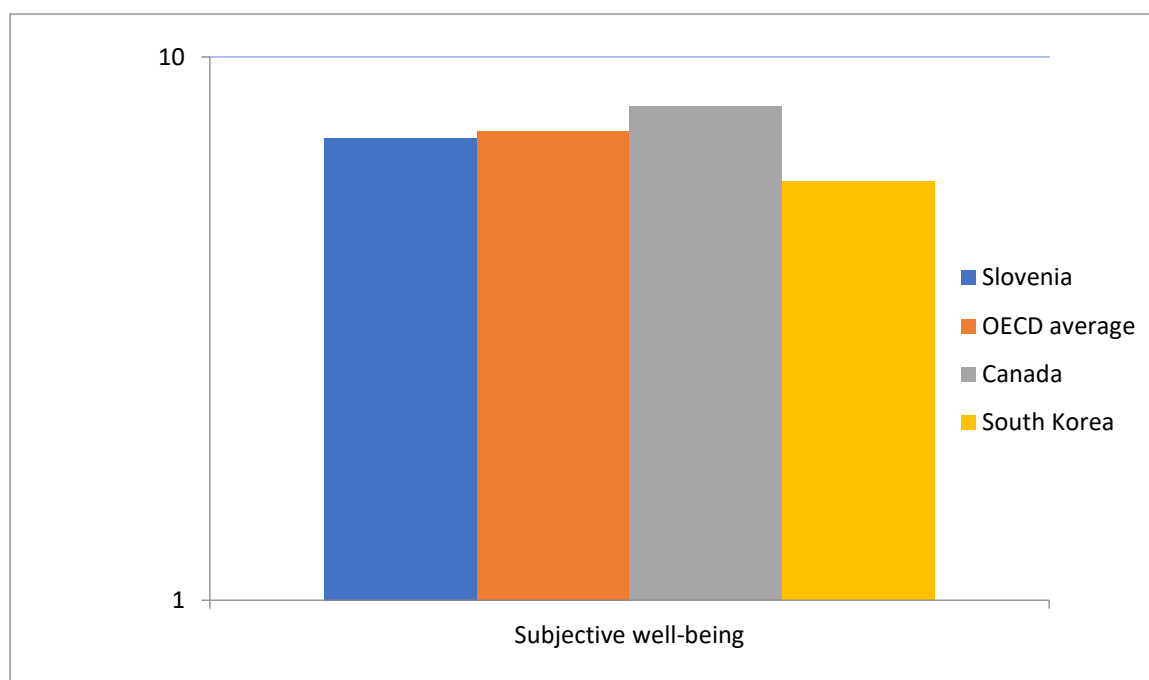




*Figure 3: Slovenia's average level of current well-being: Comparative strengths and weaknesses (OECD, 2017)*

Third section of the results is focused on longitudinal observation of changes in subjective well-being in Slovenia. We found out from the report (OECD, 2017) that subjective well-being in recent years has been very similar to the levels reported 10 years ago.

Fourth section of the results is devoted to comparison of subjective well-being of Slovenians with OECD average as well as with the countries with the highest and the lowest subjective well-being (Figure 4). Our analysis of raw OECD (2017) data shows that Slovenians express lower subjective well-being than is the OECD average. When asked to rate their subjective well-being (general satisfaction with life) on a scale from 0 to 10, Slovenians on average gave it a 7, 1 grade, lower than the OECD average of 7, 3. Country with the highest subjective well-being was Canada and with the lowest was South Korea.



*Figure 4: Subjective well-being in Slovenia, OECD average and in countries with the highest and the lowest subjective well-being in 2015 (adapted from OECD, 2017)*

### 2.2.5. Conclusions

According to our research questions: (1) How Slovenians, comparing with other OECD countries, behave in accordance to environmental issues?, (2) Have their pro-environmental behaviour changed in past 10 years? and (3) Is their environmental behaviour in any association with their subjective-well-being? The study attempts to find the objective answers. From the results of our review we could conclude:

1. Slovenians belong to the nations who follow the EU policies and regulations and therefore we express efficient and promising pro-environmental behavior.
2. The pro-environmental behavior of Slovenians has increased in past 10 years.
3. The association between pro-environmental behavior and subjective well-being of Slovenians is somehow in contradiction: pro-environmental behavior has increased in past 10 years, while subjective well-being has been very similar to the levels reported 10 years ago. And even more: in Slovenia, subjective well-being is among the lowest indicators of global well-being.

Since the lack of studies of pro-environmental behavior and subjective well-being is very difficult to state any strong interpretations and conclusions of our results. The only studies at all that we found for the past 10 years were those of Jacob etc. (2009) and Agarwala etc. (2014). According to them we could expect mutual increase of pro-environmental behavior as well as subjective well-being, but in our study the results were different. One of the possible conclusions could be that Slovenians need much more positive changes and challenges in our society than increase of pro-environmental behavior for improvement of subjective well-being. Since this is one of the first study which extracted only one dimension of global well-being, which is subjective well-being and associates it with pro-environmental behavior, much more research effort would be expected in future.

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## 2.3. Multi-Level Climate Effect Modeling, best management practices From private property to national level

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### 2.3.1. Summary

The changing climate has an effect on the quality of life in our cities: heavier rainfall (resulting in floodings), longer periods of drought, reduced air and water quality and increasing temperatures in cities (heat stress). Awareness about these changes among various stakeholders is of great importance. Every Dutch region is required to perform a stresstest indicating the effects of climate change (o.a. flooding and heatstress) before 2020. The level of execution, area size and level of participation of stakeholders, has intentionally been made flexible.

To provide more insight into the approaches and best management practices to climate resilience, this article provides 3 examples of stresstests performed on several levels: single object real estate level, city level and national district level. The method 'stresstesting', involves flood and heatstress modeling, defines the current status of climate adaptation characteristics of an object, city or district.

The stresstest forms the base line and starting point for the national 3 step approach adaptation strategy 'analyse, ambition and action'.

The 3 pilots have been evaluated as 'successful' by stakeholders and yielded a significant amount of valuable information, further improvement is recommended as increasing the participation of the private sector, in a 'quadruple helix approach'. The learning points from these 3 examples of stresstests will subsequently be implemented in the form of improved stresstesting in the near future in (inter)national cities around the world.

**Keywords:** Climate adaptation, Heatstress, Floodmodelling, Real estate

### 2.3.2. Introduction

The changing climate has an effect on the quality of life in our cities, so it affects us all. Rainfall with a high intensity and a short duration, resulting in flooding, is a well-known event. An example is the cloudburst event in Copenhagen in 2011 (150 mm rain within 3 hours), discussed later in this paper. Extreme intense storms are becoming more frequent across the world due to climate change.

Less known is the effect of increasing temperature on the built environment (heat stress) and the effect of this higher temperature on air and water quality. Awareness among various stakeholders about these changes is of great importance. In the Netherlands, the 3-step adaptation strategy comprised of 'analyze, ambition, act' is often applied. All municipalities in the Netherlands must conduct a stress test before 2020 in order to identify bottlenecks related to challenges such as flooding and heat stress. This is stated in the 'Delta Plan for Spatial Adaptation', which was presented in The Hague at the end of 2017 [Dutch Ministry Infrastructure and Environment, 2017]. When specific priority problem locations are located using flood and heat stress maps, quick win measures can be selected. A climate adaptation strategy / vision needs to be translated into spatial plans and policy domains, so that 'No Regret' measures can be taken to create a more resilient situation in the future. The long-term measures for climate proofing an area can be realized together with other projects, and thereby restrict the costs and nuisance. While stakeholders predominantly from governmental organizations are involved in these stress tests, 'quadruple helix involvement' is needed with the help private sector and residents. Governmental organizations have the opportunity and the control to select and apply climate adaptation measures in the public area, but what about the private area, what about the contribution of inhabitants to climate adaptation measures, what about our shared responsibility to a resilient built environment regarding the effects of climate change?

### 2.3.3. Method

Three pilots are reviewed where an assessment of the effects of intensive rainfall is taken place on an object, city and or district using the Calamity Levels of Urban Drainage Systems (CLOUDS) tool [Kluck et al., 2010]. This is a high level decision support tool to simulate storm water flooding. CLOUDS is based on the assumption that for a cloud burst (> 60 mm/h) most of the storm water will flow and stay above ground. CLOUDS visualizes the flow and the depth of storm water in depressions where water will accumulate. The quick-scan is only based on readily available data. The most important factor is an accurate DEM, which is freely available for the whole of the Netherlands (AHN3). With 9 points per square meter and a vertical accuracy of several centimetres this provides an insight in the surface elevation [Boogaard et al, 2017].

The quick-scan GIS-based thermal stress maps have been developed in The Netherlands in order to give quick insight into possible thermal stress locations in a city. It is based on an accurate DEM and the assumption that for quick insight into thermal stress some rough simplifications of the actual physical processes can be made. The maps give an estimate of the maximum PET (physiological equivalent temperature) during a heat wave. Such maps have also been made for other cities in European, Africa (Johannesburg) and Asia (Thailand and Taiwan) [Boogaard et al, 2016].

Table 1 3 pilots on different level of size and stakeholder involvement

| pilot | level                   | Location                   | modelling                       | Stakeholders involved                                  | background                                                                                                       |
|-------|-------------------------|----------------------------|---------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1     | Object level            | Moerdijk, The Netherlands  | Floodmodel                      | Real estate, water authority                           | (environmental) impact assessment extreme stormwater events and disasters (after a fire at Chemie-Pack in 2011). |
| 2     | City level              | Copenhagen, Denmark        | Floodmodel                      | Municipality, water authority                          | Climate effect stresstest as part of Cloudburst Mitigation Plan (after cloudburst in 2011).                      |
| 3     | National District level | Friesland, The Netherlands | Flood- and heatstress modelling | Municipality, water authority Province, national level | Stresstest flood and heatstress maps (preparing and prevention of damage for extreme climate events)             |

### 2.3.4. Example 1 - Object level: Moerdijk

Moerdijk is a municipality and a town in the South of the Netherlands, in the province of North Brabant. Moerdijk is a well-known name in the Netherlands, because of the large Moerdijk industrial area. In 2011 research started in that area on the effects of climatechange when a disaster happened in that area. On January 5 in 2011 a devastating fire started on the Chemie-Pack site, located on a large industrial park in Moerdijk, 35 kilometers south of Rotterdam. The company (activities: packing, filling and labelling of hazardous chemicals, including pesticides) was completely destroyed. Two neighboring companies were also destroyed and several others incurred severe damage. The fire went as high as 40 meters and could be seen for some 40 kilometers around; motorways and railroads were blocked off and it took the firefighters more than 30 hours to control the fire. No people were injured<sup>3</sup>.

Chemie-Pack, a family business for more than 60 years, had permission to store 4,000 tons of hazardous chemicals, including pesticides. The fire fighters decided to allow the fire to burn out on its own under controlled conditions before starting to extinguish the fire with foam. The area surrounding the fire zone was subjected to severe pollution, raising a lot of consternation. The disaster resulted in 35,000 square meters of contaminated water and 1,800 tons of contaminated soil. It must be assumed, therefore, that all 4,000 tons of chemicals were released into the environment [De Munnik, 2011].

In order to prevent accidents and provide more info to prevent or act, CLOUDS was used after the event to give insight into water management during regular situations and extreme events (fire brigade during fire, intensive rainfall) as indicated in figure 1. The fire was allowed to burn under controlled conditions and the area surrounding the fire zone was subjected to severe pollution, raising a lot of consternation.

<sup>3</sup> <https://www.internationallawoffice.com/Newsletters/Environment-Climate-Change/Netherlands/NautaDutilh/Government-takes-Chemie-Pack-to-court-over-remediation-following-fire>



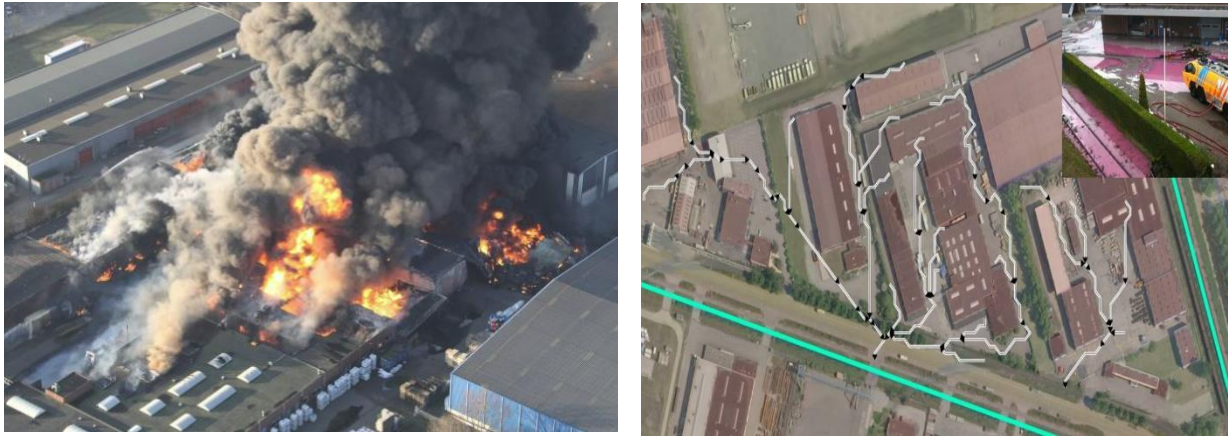


Figure 1a (left) Fire in chemical firm, Moederijk 5 January 2011 (source: KLPD DLV<sup>4</sup>). (1b, Right) modelling of water with CLOUDS.

Under the final conclusions and recommendations of The Dutch Safety Board [The Dutch Safety Board, 2012] it is noted that by addressing the lack of knowledge, action before and after a disaster could be improved. More insight and open control over data should be stimulated. The results of quick-scan tools such as CLOUDS could help provide insight into the effects of climate change and disasters. Figure 1b gives a visual presentation of the floodmodel that was used to calculate the streamtracks (flow of water) at the company and environment. Figure 2 shows the locations where contaminated water reaches the surrounding waterways. These calculations were initiated by private company and water authority as an environmental impact assessment.



Figure 2 modelling of water with CLOUDS to prevent pollution of water and soil (The disaster resulted in 35,000 square metres of contaminated water and 1,800 tons of contaminated soil).

### 2.3.5. Example 2 - City Level: Copenhagen

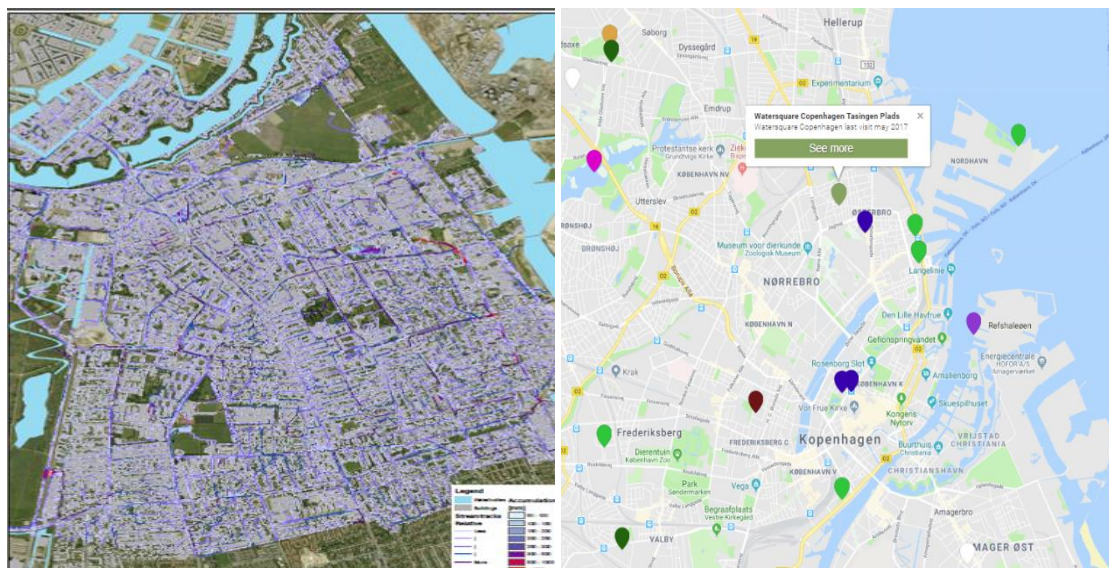
150 mm of rain fell on the city of Copenhagen in less than 3 hours on July 2<sup>nd</sup>, 2011, flooding parts of the city with up to a metre of water. This “cloudburst” event (from the Old Danish word Skybrud), caused damage in

<sup>4</sup> <https://www.onderzoeksraad.nl/en/beeldbank/910/fire-in-chemical-firm-moerdijk-5-january-2011?s=0124D454CC0641CA8169BCF127D36E205596AF33>



excess of 6 billion Danish kroner (US\$863 million), not including direct costs such as repairing municipal infrastructure or indirect costs such as loss of earnings (IWA, 2016). The total socio-economic loss has been estimated to be double this amount. In recognition of the significant impact on society and the economy, the city produced a Cloudburst Mitigation Plan. This plan, and the subsequent catchment level plans (example figure 3a), identifies the parts of the city most at risk from future cloudburst events, and proposes a toolkit of solutions to increase the city's resilience to flooding.

The overall principles of the strategy are: to retain rainwater in the upper catchment; to provide robust and adaptable drainage of lower lying areas; and to focus on implementing green and blue solutions in existing projects (example figure 3b).



*Figure 3 CLOUDS model Copenhagen by EnviDan and Tauw (left). 3b Mapping Sustainable Urban Drainage Systems for international knowledge exchange on [www.climatescan.nl](http://www.climatescan.nl)*

To combat the impacts of cloudbursts, the City of Copenhagen developed a Cloudburst Management Plan in 2012 (City of Copenhagen, 2012). The Plan outlines the priorities and measures recommended for climate adaptation including extreme rainfall. The City carried out an overall assessment of the costs of different measures (traditional vs. different options including adaptation measures), the cost of the damages despite the measures and resulting financial impact.

It was showed that continuing to focus on traditional sewage systems would result in a negative societal gain: despite capital investments, financial damages from flooding would remain high and not justify the high investment in measure implementation. On the other hand, the combined solution (including adaptation) would result in a net saving.

The chosen measures for climate adaptation consist of expanding the sewer network and around 300 surface projects focusing on water retention and drainage [City of Copenhagen, 2011]. Some of these surface projects can be found on the open source web-based page [www.climatescan.nl](http://www.climatescan.nl) (figure 3b)

### 2.3.6. Example 3 - National District level Stress test province of Fryslân

Recently a stress test for the whole province of Fryslân has been conducted using flood maps and heat stress maps (Boogaard et al, 2018). The flood maps indicate vulnerable low-lying areas, whereas heat map indicate open, unshaded areas where severe thermal discomfort can be expected. In a triple helix composition (governments, companies and knowledge and educational institutions) experts of 20 municipalities divided over 7 masterclasses have compared the flood and heat stress maps with the real situation and with their own experiences. After comparison and addressing priority problem locations, concrete climate adaptation measures were suggested for these locations. In these masterclasses the steps from the adaptation strategy were taken from 'analyse' to 'act'.

In addition to area specific measures the masterclasses gave the participants more insight into potential risk areas. The municipalities acknowledged the mutual problems they have regarding climate adaptation. Shared learning as done in the masterclasses was experienced as positive and supportive. The municipalities often miss a kind of review framework to determine water and heat nuisance and to decide when to take action. Sometimes this depends on the amount of complaints of the residents. A vision or Climate Adaptation Plan could, in such situations, offer a solution and be consulted or incorporated in new spatial plans to restrict problem areas in the future.



Figure 4 heatstressmap Leeuwarden (left), workshop with stakeholders (right)

Thermal comfort (heat stress) is quite a different kind of nuisance compared to flooding. Although the effects of heat stress in a delta area such as the province of Fryslân is not yet clear, the participants admitted specific attention should be paid to vulnerable areas such as homes for the elderly and hospitals.

While it is difficult to support heat stress restricting measures in this stage, during realisation of spatial plans scheduled in the near future, green and other shadow stimulating measures could also be applied. Green measures decrease temperature through evapotranspiration and often provide shadow, water with enough depth or streaming water reduces the temperature in the direct vicinity and well-oriented buildings can provide shadow during the hottest moments of the day.

Moreover, green measures not only provide a cooling effect, they also have an added value for biodiversity and health and are able to retain water.

### 2.3.7. Discussion Stresstesting and participation on several levels

The realisation of floodmaps in the 3 examples showed that the level of participation of several stakeholders is different, and regarded as important for the acceptance of the end result and for the next steps (implementation of measures to mitigate the effects of climate change). At 'object level' in example 1, the water authority was mostly involved, whereas in contrast, at 'city level' in example 2, both the residents of Copenhagen and the public sector were involved in the implementation of climate adaptation measures. The first 2 examples were disaster driven, which helps in the recruitment of participation and budget at an early stage, example: the city of Copenhagen has also called the cloudburst a 'fundraising event'. The third example - 'Fryslan' - is not disaster driven but learnt from disasters such as the disaster in Copenhagen. A large area and all stakeholders were involved in the masterclasses, but it could be improved by getting the private sector involved.

### 2.3.8. Conclusions

In conclusion, the outcomes of the 3 pilots show that aside from the size of area (object, city or national district) and level of participation of stakeholders, there is a clear demand for quickscan models 'stresstest' and a collaborative knowledge sharing tools where first impressions of different urban resilience projects can be quickly gained. It is advised to run a stresstest as precaution measure instead of acting after a disaster as in pilot 1 and 2, and involve multiple stakeholders as in pilot 3. Quickscan models can give a fast interpretation of areas being flooded during extreme rainfall or areas with high temperatures during heatwaves. Improvements of the stresstest procedure derived from these 3 pilots are:

- While stakeholders predominantly from governmental organizations are involved in these stress tests, 'quadruple helix involvement' is needed
- More involvement of the private sector and especially real estate owners (from inhabitants owning a house to large area real estate owners) since their assets are effected with the effects of climate change
- Shared learning and cooperation between stakeholders is necessary to develop a climate adaption plan
- Not only floodmaps should be created. Masterclasses and workshops (example stresstest Fyslan and Copenhagen) create awareness about climate adaptation among stakeholders.
- The flood- and heatstress maps could be further improved and used by urban planners and other stakeholders to assess the resilience and well-being of cities and individual properties. The work presented shows that the floodmodelling is the main interest but combined analysis of heatstress and floodmaps in example 3 also has a strong potential. Its recommended to use combined maps for the analysis of other challenges in urban dense areas such as air and water pollution, immobility and noise disturbance.
- Further involvement and awareness of stakeholders can be created by means as a planned City Climatescan which is a methodology to measure, map, scan and assess different parameters that provide insight into the vulnerability of urban areas and neighborhoods

The 3 pilots show that the level of participation of several stakeholders varies with size and approach of the area. Higher participation of stakeholders, especially the private sector, is regarded as important for the next step in the national climate adaptation approach from 'ambition to action' to implement measures to mitigate the effects of climate change.

### 2.3.9. Acknowledgements

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### 3. Construction

### 3.1. Dark Side of Boosting Building Renovation in European Real Estate Market

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#### 3.1.1. Abstract

**Background:** About 75% of buildings in Europe (EU) are energy inefficient and, depending on the Member State, 0.4-1.2% of the stock is renovated each year. Article 5 of Directive 2012/27/EU explicitly states: “from 1 January 2014, 3% of the total floor area of heated and /or cooled buildings owned and occupied by its central government is renovated each year.” The present day extensive renovations are going in wrong direction, towards narrow-minded measures in the frame of thermally well insulated and air tightened building envelope, and highly efficient mechanical systems. Such non-holistic approach results in minimized building energy use but also in uncomfortable and unhealthy conditions as well as other negative health-related outcomes. This problem is recognized in Explanatory Memorandum of the new EPBD 2016 proposal, where health problem is explicitly quoted.

**Purpose of Study:** Our discussion is focused on general policy of health and comfort position in the framework of energy efficiency of buildings. It is based on relevant case studies of renovated public and residential buildings.

**Sources of Evidence:** Comprehensive overview of European legislation, analyses of case studies (inspection, measurements, simulations).

**Main Argument:** Deteriorated indoor environment quality in analysed buildings present collateral damage of performed energy renovations and constructions. The detected causes are mainly self-sufficient subjects involved in current design process, missing multidisciplinary approach, deficiencies in legal requirements, non-bioclimatic and non-holistic design of building as a whole, constructional products, complexes and their systems.

**Conclusions:** Recommendations can be used in national policies and strategies in all stages of healthy and energy efficient design of buildings.

**Keywords:** Performance efficiency, Energy efficiency, Real estate market, Renovation, Indoor environmental quality, Air quality, Health outcomes



### 3.1.2. Introduction

In the context of all end-use sectors, buildings represent the largest sector and consume about 40% of total final energy requirements in Europe (EU), followed by transport with 33% (EP, 2016). In terms of CO<sub>2</sub> emissions, buildings are responsible for around 36% and account for 55% of electricity consumption in EU (EC, 2018). The residential stock is the biggest segment with floor space of 75% of the building stock in EU. In 2009, EU households were responsible for 68% of the total final energy use in buildings (BPIE, 2011). Non-residential buildings comprise a more complex and heterogeneous sector compared to the residential sector and account for 25% of the total stock in EU (BPIE, 2011).

Within the existing building stock, more than 40% (European Parliament, 2016) was built before 1960s and 90% before 1990, and contributes greatly to the high energy consumption in building sector. The average heating consumption levels in terms of final energy use of single family homes by construction year 1960 is 150-350 kWh/(m<sup>2</sup>) and by construction year 1990 108-268 kWh/(m<sup>2</sup>) (depending on the Member State) (BPIE, 2011). The average specific energy consumption in non-residential sector is 280 kWh/m<sup>2</sup> (covering all end-uses). European Commission (EC) states that the greatest energy saving potential lies in buildings. The estimated savings potentials in residential and commercial buildings (tertiary) are 27% and 30%, respectively.

Europe has been addressing with energetic problems by introducing several regulatory and voluntary initiatives and schemes to stimulate energy efficiency in all Member States. The main policy driver related to the energy use in buildings is Energy Performance of Buildings Directive (EPBD 2010/31/EU) that has set an energy savings target of 20% by 2020, mainly through energy efficiency measures. Article 5 of Directive 2012/27/EU explicitly states: "from 1 January 2014, 3% of the total floor area of heated and /or cooled buildings owned and occupied by its central government is renovated each year." Moreover, EPBD 2010/31/EU requires »all new buildings to be nearly zero-energy by the end of 2020. All new public buildings must be nearly zero-energy by 2018«.

Despite strict legal requirements, renovation rate of current building stock is still not efficiently intense. Depending on the Member State, only 0.4-1.2% of the stock is renovated each year (EPBD Proposal 2016) and it is estimated that renovation accounts for 57% of all construction activity (EP, 2016). European Parliament (2016) defined regulatory and voluntary initiatives or schemes to boost renovation rate, which are: regulatory (e.g. mandatory building codes, minimum Energy Performance Standards); financial and fiscal (e.g. tax incentives), information campaigns and labelling (e.g. awareness raising, EU Energy Performance Certificates), and others (e.g. skills development and capacity building programmes).

To summarize, the present day extensive renovations are going in the direction of increasing building energy efficiency through improvements on building envelope systems and mechanical systems. For example, U values of external walls built before 1960s are 1.5-2.5 W/(m<sup>2</sup>K), in 1990 0.8-1.2 W/(m<sup>2</sup>K), compared to 2010, when they are 0.2 W/(m<sup>2</sup>K) (BPIE, 2011). Air tightness levels (n<sub>50</sub> measured in h<sup>-1</sup>) of single family houses built in 1990s are 0.7 h<sup>-1</sup> (Denmark) and 0.8 h<sup>-1</sup> (Germany), in 2010 0.6 (Denmark) and 0.27 h<sup>-1</sup> (Germany). As a result of energy efficiency measures, the final energy consumption of households in the EU was declining by 11% over the 2005–2015 period (EEA, 2017).

Such non-holistic approach results in not only minimized building energy use, but unfortunately also in collaterally uncomfortable and unhealthy conditions as well as other negative health-related outcomes. This problem is recognized in Explanatory Memorandum of the new EPBD 2016 proposal, where health problem is emphasised.

The paper discusses the general policy of health and comfort position in the framework of energy efficiency of buildings. Detected problems related to indoor environmental inequalities in renovated public and residential buildings are presented by relevant case studies. Recommendations supported by evidence based design can be used in national politics and strategies in all stages of healthy and energy efficient design of buildings.



### 3.1.3. Sources of Evidence

Comprehensive literature review was carried out studying energy efficiency of real estate market in relation to indoor environmental quality. In the period of March to May 2018 we searched bibliographic databases Science Direct and Pub Med for peer-reviewed publications from 1983 to 2018. The key-words were written in English: »real estate market«, »residential buildings«, »non-residential buildings«, »energy efficiency«, »renovations«, together with »health outcomes«, »sick building syndrome«, »building related illness«, »indoor environmental quality«, »air quality«, »thermal comfort«, »noise«, »ventilation«, »HVAC«. Titles, abstracts or both, of all articles, were reviewed to assess their relevance. We reviewed legislative documents of the EUR-Lex, European Commission (EC), Official Journal of RS, Ministries of the Republic of Slovenia (GOV SI); ISO standards; American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standards. We reviewed reports and other documents of the Eurostat; guidelines, manuals and handbooks of the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), Environmental Protection Agency (EPA), Health Protection Agency (HPA), Occupational Safety and Health Administration (OSHA), International Labour Organization (ILO), National Institute for Occupational Safety and Health (NIOSH).

On the basis of the literature review the main problems related to energy efficiency measures and indoor environmental quality are defined. Building case studies presented renovated public and residential buildings.

### 3.1.4. Main Argument

#### Policy Framework for Energy Efficiency

The European policy framework for energy efficiency in real estate market includes Energy Efficiency Directive 2012/27/EU (Directive 2012/27/EU) and Energy Performance of Buildings Directive (EPBD-r 2010/31/EU), CPR 305/2011 and Renewable Energy Directive 2009/28/EC (Directive 2009/28/EC). Directive 2012/27/EU and EPBD-r 2010/31/EU present the main energy efficiency policy instruments in the European Union for reaching the energy efficiency goals in real estate market.

Energy performance certification of buildings is an important instrument to enhance the energy performance of buildings and is used as a policy tool to improve energy efficiency (BPIE, 2010). EPCs became compulsory in 2006. In 2010, EPBD-r 2010/31/EU added a set of new requirements to improve the quality, usability and public acceptance of EPCs. It includes the energy performance of a building and reference values, such as minimum energy performance requirements, in order to make it possible for owners or tenants of the building or building unit to compare and assess its own energy performance (EPBD-r 2010/31/EU). Existing energy performance certificates (EPCs) in Slovenia are produced on calculated or measured energy rating, contain basic information on the building and side characteristics, used energy sources, renewable energy sources and detailed energy efficiency indicators: delivered energy for heating, cooling, ventilation, domestic hot water, lighting, appliances or to produce electricity, primary energy and CO<sub>2</sub> emissions. In some other countries, such as Portugal, EPCs cover indoor air quality as well as energy performance (BPIE, 2010). However, the EPCs that include information on indoor environmental quality are still rather an exception than a rule.

On 30 November 2016 EC prepared the novel EPBD proposal (2016), where the objectives are: »integrating long term building renovation strategies, supporting the mobilisation of financing and creating a clear vision for a decarbonised building stock by 2050; encouraging the use of information and communication technology and smart technologies to ensure that buildings operate efficiently; and streamlining provisions where they have not delivered the expected results«.

Member States adopted and implemented several legal acts. Specifically in the Republic of Slovenia, national legal requirements on energy efficiency of buildings are defined in Building Act (O.J., no. 61/17, with amend.), Energy Act (O.J., no. 17/14 with amend.) and in Action Plan for Nearly Zero-Energy Buildings, 2014 (AN sNES). Specific technical requirements for efficient energy use in buildings are stated in Rules on efficient use of energy in buildings with a technical guideline (PURES 2010, TSG-1-004:2010). Moreover, methodology and supervision of energy performance certificates, content and form of certificates are specified in Rules on the methodology for the production and issuance of energy performance certificates for buildings (O.J. RS, no. 92/14).

Action Plan for Energy Efficiency (2007-12) planned to extend the scope of Energy Performance of Buildings Directive in order to cover small buildings, to develop minimum performance standards applicable to new and renovated buildings and to promote "passive" houses. In Slovenia Action Plan for Energy Efficiency 2017–2020 (AN sNES 2020) presents the second action plan defined in the framework of Directive 2012/27/EU.

Construction Products Regulation, No. 305/2011 (CPR 305/2011) presents the umbrella directive on constructions products and works. »Construction works as a whole their separate parts must be fit for intended use, taking into account in particular the health and safety of users involved throughout the life cycle of the work. Construction works must satisfy the basic requirements for an economically reasonable working life« (CPR 305/2011). Basic requirements for construction works (CPR 305/2011) are: 1. Mechanical resistance and stability, 2. Safety in case of fire, 3. Hygiene, health and the environment, 4. Safety and accessibility in use, 5. Protection against noise, 6. Energy economy and heat retention, 7. Sustainable use of natural resources. Indeed, four of seven basic requirements are directly related to health and safety of users, they are often overlooked.

### **Policy Framework for Indoor Environmental Quality**

Health is a basic human right and a priority in international and national legal acts and strategic documents (European Social Charter, OJ RS, No. 24/1999 with amendments; European Convention on Human Rights (ECHR)). The fundamental law of the Republic of Slovenia is the Constitution of the Republic of Slovenia. Article 72 stipulates that everyone has the right to a healthy living environment in accordance with the law (Constitution RS, OJ RS, No. 33/91-I, with amend.).

Basic human rights have to be guaranteed in every constituent of the built environment, living as well as working. Health and safety of working environment are regulated with Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace. Opposite to working environment, many areas of living environment are not yet regulated by law and are governed by recommendations set by different organisations. For example, UK has adopted the Housing Health and Safety Rating System (HHSRS). HHSRS is a qualitative, hazard-based assessment approach for conditions in houses. It is used for landlords and local authorities and deals with the hazards and risks and defines actions to provide health and safety in dwellings (DCLG, 2006).

In building certification schemes health aspects are generally poorly implemented. An exception presents a building certification scheme called WELL Building Standard, prepared by International Well Building Institute. It covers air, water, nourishment, light, fitness, comfort and mind (WELL, 2017).

The third basic requirement of the CPR 305/2011, Hygiene, health and the environment, explicitly claims that »construction works must be designed and built in such a way that they will, throughout their life cycle, not be a threat to the hygiene or health and safety of workers, occupants or neighbours, nor have an exceedingly high impact, over their entire life cycle, on the environmental quality or on the climate during their construction, use and demolition, in particular as a result of any of the following: (a) the giving-off of toxic gas; (b) the emissions of dangerous substances, volatile organic compounds (VOC), greenhouse gases or dangerous particles into indoor or outdoor air; (c) the emission of dangerous radiation; (d) the release of dangerous substances into ground water, marine waters, surface waters or soil; (e) the release of dangerous substances into drinking water or substances which have an otherwise negative impact on drinking water; (f) faulty discharge of waste water, emission of flue gases or faulty disposal of solid or liquid waste; (g) dampness in parts of the construction works or on surfaces within the construction works«.

Although the CPR has been in force since 2011 (note: in 1989, basic requirements were defined in older version of CPR, Directive 89/106/EGS 1989), indoor health and comfort aspects are still not sufficiently considered. The problem was highlighted in the report on analysis of residential building regulations in 8 Member States (BPIE, 2015); the report concludes: "Indoor health and comfort aspects should be considered to a greater extent in European building codes than is current practice. When planning new nearly zero-energy buildings or nearly zero-energy buildings, refurbishments, requirements for a healthy and pleasant indoor environment should be included" (BPIE, 2015).

Health, comfort and wellbeing are highlighted in EPBD-r 2010/31/EU and EPBD proposal (2016): »Measures to improve further the energy performance of buildings should take into account climatic and local conditions as well as indoor climate environment and cost-effectiveness. These measures should not affect other requirements concerning buildings such as accessibility, safety and the intended use of the building« (EPBD-r 2010/31/EU).

Back in 2016, legislative movements were detected; health, comfort and wellbeing became the central point of design: "Better performing buildings provide higher comfort levels and wellbeing for their occupants and improve health by reducing mortality and morbidity from a poor indoor climate. Adequately heated and ventilated dwellings alleviate negative health impacts caused by dampness, particularly amongst vulnerable groups such as children and the elderly and those with pre-existing illnesses" (EPBD proposal, 2016).

As it was presented, the importance of health aspects in buildings is increasing in European legislation. Unfortunately, this cannot be noticed in national legal acts in Slovenia.

### **Health outcomes and energy efficient buildings**

In spite of the fact that the problem of health in the indoor environment was exposed decades ago, e.g. WHO (1983): EURO Reports and Studies No. 78 and Regional Office for Europe, Copenhagen and in Slovenia (Krainer, 1994): Bioclimatic Design and High-Tech: Dissimilarity or Synergy, the situation of health connected problems in the design of living and working environment is still very worrying (Krainer, 2008).

Global Health Observatory (GHO) data (WHO, 2017) revealed that in 2012, 12.6 million people died as a result of living or working in an unhealthy environment, which represents 23% of all deaths. The most common health outcome in research studies as well as in public media is Sick Building Syndrome (SBS). US Environmental Protection Agency (ECA, 1989) describes SBS as situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified. The complaints may be localized in a particular room or zone, or may be widespread throughout the building. The characteristic symptoms of SBS that may occur singly or in combination with each other are headache, eye, nose, or throat irritation, dry cough, dry or itchy skin, dizziness and nausea, difficulty in concentrating, fatigue and sensitivity to odours (ECA, 1989; Dovjak, Kuček, 2014).

Sick Building Syndrome is often wrongly confused for with Building Related Illness (BRI). The term Building Related Illness (BRI) is used when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants (ECA, 1989).

The World Health Organization (1983) estimated that up to 30% of new and renovated buildings worldwide may be related to SBS. Comprehensive literature review of epidemiological studies in public buildings showed that from 20% to 50% of employees experience SBS symptoms in public buildings, and 12% to 31% in residential buildings (Dovjak, Kuček, 2014). Building users are exposed to numerous health risk factors for SBS (i.e. likelihood that a given exposure or series of exposures may have damaged or will damage the health of individuals in living or working environments) (EPA, 2016). Identified health risk factors for SBS are (Dovjak, Kuček, 2014):

Physical: parameters related to thermal comfort, ventilation, noise and vibration, electromagnetic radiation, daylighting, ergonomics and universal design

Chemical: indoor air quality, constructional products, household products, tobacco smoke, biocides, odour, etc.

Biological: bacteria, viruses, mould

Psychosocial: social status, occupational stress, etc.

Personal: gender, health status, individual differences, etc.

Others.

### Inadequate Ventilation in Energy Efficient Buildings: Causes and Consequences

According to Awbi (2003) the general purpose of ventilation in buildings is to provide healthy air for breathing by diluting the pollutants originating from the building itself and activities performed in the building and removing the pollutants from it. With the goal to attain highly energy efficient buildings, building envelope is air tightened and highly efficient mechanical systems, supported by heat recuperators are installed. Especially in public buildings, ventilation losses are often minimised by decreasing amounts of fresh air per occupant. Unfortunately, such current design approach is in Slovenia supported by national legislation (Table 1).

*Table 1: List of required and recommended design ventilation rates in Republic of Slovenia.*

Active space: playrooms in kindergarten (Rules on the ventilation and air-conditioning of

Building, OJ RS, No 42/02 with amend.; PURES 2010; TSG-1-004: 2010).

| Design ventilation rate (reference)             |                                                 |                                           |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------|
| Required value<br>(Rules on the ventilation)    | Minimal air changes per hour<br>(ACH)           | 0.5/h                                     |
| Required value<br>(Rules on the ventilation)    | Minimal volume of air per person                | 8.7 m <sup>3</sup> /hm <sup>2</sup>       |
| Required value<br>(Rules on the ventilation)    | Minimal outdoor air intake                      | 15 m <sup>3</sup> /h per person           |
| Required value<br>(Rules on the ventilation)    | Minimal volume of air per floor<br>surface area | 1.5 m <sup>3</sup> /h per m <sup>2</sup>  |
| Required value<br>(Rules on the ventilation)    | Minimal air volume                              | 10.1 m <sup>3</sup> /hm <sup>2</sup>      |
| Recommended value<br>(Rules on the ventilation) | Air volume                                      | 55 m <sup>3</sup> /h per person           |
| Required value<br>(PURES 2010)                  | ACH                                             | Not lower than 0.7/h during<br>occupation |
| Required value<br>(TSG-1-004: 2010)             | Min (ACH) for residential<br>buildings          | 0.5/h                                     |

Although higher criteria for indoor air quality parameters are recommend in standards, due to the fact these values are not required by law, there are neglected in practice. EN 15251 (2007) defines indoor environmental input parameters for the design and assessment of energy performance of buildings, addressing indoor air quality, thermal environment, lighting and acoustics. Design input criteria for the dimensioning of buildings and ventilation systems are given for four categories. Category I presents high level of expectation and is recommended for spaces occupied by very sensitive and fragile persons with special requirements like handicapped, sick, very young children and elderly persons, Category II normal level of expectation and should be used for new buildings and renovations, Category III an acceptable, moderate level of expectation and may be used for existing buildings, Category IV values outside the criteria for the above categories. The last category should only be accepted for a limited part of the year. It should be emphasised that according to Slovenian legislation, the permissible value of CO<sub>2</sub> in indoor air is 1667 ppm and corresponds to the criteria for Category IV i.e. 800 ppm above background outdoor concentration.

Current design of building ventilation is based on the fulfilment of minimal permissible levels, in other words physiological minimums. Inadequate ventilation as a result is associated not only with the accumulation of a variety of pollutants, from building materials and indoor activities, dampness, and with a higher risk of airborne infectious disease transmission among the occupants but also in reduced productivity. WHO (2016) reported that 4.3 million people a year died because of the exposure to indoor air pollution.

The main causes for health outcomes related to building ventilation and defined by studies were inadequate functioning, obsolete and unmaintained HVAC system decreased number of air changes and consequently decreased volume of clean air. Literature review of 41 studies (Seppänen et al. 1999) showed that ventilation rates below 10 L/s per person in office buildings were associated with statistically significant worsening in one

or more health or perceived air quality outcomes. Some studies determined that increases in ventilation rates up to approximately 20 L/s per person were associated with significant decreases in the prevalence of the SBS symptoms or with significant improvements in perceived IAQ. The reviewed studies reported relative risk (RR) of 1.5-2 for respiratory illnesses and RR of 1.1-6 for the SBS symptoms for low compared to high ventilation rates.

Literature review by Carrer et al. (2015) estimated the minimum ventilation rates when no effects on some health outcomes were observed. The lowest ventilation rates, when no adverse effects were seen for respiratory symptoms, asthma or allergy symptoms, airborne infectious diseases or acute health symptoms were about 6–7 L/s per person. Additionally, they claimed that in terms of effects on short-term absence rates and performance and learning, these minimum rates were much higher, ranging from 16 to 24 L/s per person. As a result, ventilation rates as high as 25 L/s per person or even 40–50 L/s per person would have to be recommended, as these are the highest rates, at which no effects on health were observed. The authors concluded that in many cases higher ventilation rates will reduce health outcomes, and that there are minimum rates, at which some health outcomes can be avoided.

Values are often defined for general population and not for vulnerable population groups. Thus, design has to follow optimal values, considering the sensibility of the exposed populations.

Energy efficiency renovations have dark side, as already highlighted by several researchers (Krainer, 2008). Földvály et al. (2017) evaluated the impact of simple energy renovation on indoor air quality, air exchange rates and occupant satisfaction in Slovak residential buildings: “Földvály et al. (2017) showed that CO<sub>2</sub> concentrations were significantly higher and air exchange rates were lower in renovated buildings. Formaldehyde concentrations increased after renovation and were positively correlated with CO<sub>2</sub> and relative air humidity. Energy renovation was associated with lower occupant satisfaction with indoor air quality”.

Until the scientists are looking for the lowest possible values and thus, by the way, gambling with human health, there will be no real performance oriented design.

### Case study

This case study presents actual kindergarten in Slovenia (4345.4 m<sup>3</sup>, 1289.6 m<sup>2</sup>) renovated in 2016. Concentrations of CO<sub>2</sub> were calculated in one model playroom for age groups 1 with CONTAM version 3.2. Three-dimensional model of the selected parts of the actual building was established according to the provided floor plans and technical description of the building. For the simulation of CO<sub>2</sub>, one ventilation zone (i.e. playroom B for age group 1, 1-2 years: 32.5 m<sup>2</sup>, 98.80 m<sup>3</sup>) was selected. The main objective was to critically assess the national ventilation requirements from the aspects of indoor air quality.

*Table 2. Calculated concentrations of CO<sub>2</sub> [ppm] in analysed model playroom for five scenarios of variations of required and recommended ventilation rates (Rules on the ventilation and air-conditioning of building. O.J. RS, No 42/02 with amend.).*

| Required and recommended ventilation rates       | Calculated CO <sub>2</sub> concentration [ppm] | Required and recommend CO <sub>2</sub> levels                                                                                                                                        |
|--------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.Scenario: 0.5/h                                | 4116                                           | 1667 ppm (maximum permissible level, national rules);<br>750 ppm (recommended level for Category I , EN 15251:2007);<br>1000 ppm (recommended level, ANSI/ASHRAE Standard 62.1:2004) |
| 2.Scenario: 8.7 m <sup>3</sup> /hm <sup>2</sup>  | 1049                                           |                                                                                                                                                                                      |
| 3.Scenario: 15 m <sup>3</sup> /h per person      | 1165                                           |                                                                                                                                                                                      |
| 4.Scenario: 10.1 m <sup>3</sup> /hm <sup>2</sup> | 959                                            |                                                                                                                                                                                      |
| 5.Scenario: 55 m <sup>3</sup> /h per person      | 609                                            |                                                                                                                                                                                      |

Table 2 presents the calculated concentration of CO<sub>2</sub> in model playroom for five scenarios, where the required and recommended design ventilation rates varied according to national legislation. The calculated CO<sub>2</sub> concentration includes background outdoor concentration 400 ppm.

The highest CO<sub>2</sub> concentration was reckoned up in scenario with ACH 0.5 (4116 ppm), while the lowest CO<sub>2</sub> concentration was in scenario with 55 m<sup>3</sup>/h per person (609 ppm). In playroom for scenario with ACH 0.5, the calculated cCO<sub>2</sub> exceeded the required and recommended values by 4 and 2.5 times. Only design ventilation rates that take into account the expected number of occupants resulted in optimal air quality for Category 1 spaces.

### 3.1.5. Conclusion

Improvement of comfort has to be one of the main drives for renovations and not just saving energy. Interestingly, users are aware of these issue. The Velux (2017), a series of Pan-European surveys, found out that renovation, mainly due to increased comfort conditions and health, is one of the leading selection motives of the occupants. Additionally, recent studies have shown that costs of poor indoor environment for the employer, the building owner and for society as a whole, are often considerably higher than those of the energy used in the same building (EN 15251:2007).

In order to design healthy and comfortable buildings, holistic actions are needed on the level of legislation, supervision, expert training and user awareness. Building design must follow all bioclimatic principles, where users' needs and demands. Design criteria for indoor environmental quality should not present minimal permissible values, but optimal ones, considering the exposed populations.

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## 4. Demographic Transition and Built Environment

## 4.1. Taxation and investing in the community's infrastructure for ageing cohorts

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### 4.1.1. Abstract

In the last 15 years, Slovenia is trying to reach a consensus on long-term care and long-term care insurance that would define services to provide care for elderly people with declining functional abilities and depend on the help of others during their activities of daily life. Public policies and private initiatives have forced at the forefront of current problems a serious deficit in the capacities of Slovenian elderly homes and other assisted living facilities such as sheltered housing. Most local communities are unable to keep pace with demand for facilities needed for provision of services for older persons. Their primary obstacle is financial capacity or capability to invest in the social infrastructure. The paper is presenting the Slovenian community's social infrastructure needs and identifying methods to invest in the infrastructure to meet the demand of an expanding number of old people in the community. Municipal revenues are comprised of various sources. Article 6 and 7 of the Financing of Municipalities Act (the Official Gazette of the Republic of Slovenia no. 123/2006, 57/2008, 36/2011 and 14/2015 - ZUUJFO)) listed them: real estate taxes, water vessel tax, real property transaction tax, inheritance and gift tax, gaming tax and other taxes, in accordance with the law governing a particular tax. Financial resources for the municipalities also include revenues from voluntary contributions, levies, fines, concession fees, payment for local services and others in accordance with the legislation that governs individual levies or in accordance with regulations adopted under the law. Municipal revenue also includes the material and financial assets of the municipality, received donations and transfer revenues from the state budget and resources from the European Union funds. Financial resources also include revenue from income tax and other taxes, which are part of the state budget revenue in accordance with law for each fiscal year in the amount of the total municipal expenditure.

One of the tax revenues is a tax on property, which is a real property tax comprising of tax on real estate (property tax and the building land use charge) and other taxes for the use of goods and services. Our research focuses only on the revenues from taxes on real estate which will replace the current property tax, the building land use charge, and fees for the maintenance of forest roads. The new tax legislation will influence the municipal revenue from which a part is suggested to be invested in the local social infrastructure. The conclusion is that we have to define standards of social infrastructure in the context of the spatial planning also for providing assisted living facilities and other facilities for older adults. For these construction activities, a part of property taxes should be assigned. Currently, the municipalities collect 202 Mio Eur of community fees. With the introduction of the new property taxes, there is a plan for an increase in the amount to 330 Mio Eur. Our projections show that Slovenia will need to develop 36000 new assisted living housing units for older persons till 2050. Therefore 60 Mio Eur from this difference per year is suggested to be invested in the development of the assisted living facilities for the provision of the long-term care, which will potentially decrease the needed amount of budget for healthcare, like concluded by Wood (2017). To smooth the investment process, the financial plan developed here includes the use of financing with already available loans from the European Investment Bank.

**Keywords:** Long-term care, Facilities, Taxation, Financial plan, Investments

#### 4.1.2. Introduction

Slovenia faces demographic decline and an aging population. The Ageing Report 2018, published in November 2017 (EC, 2017), gives projections of the aging of the Slovenian population in the period 2016-2070. In Slovenia, the life expectancy at birth for men is projected to increase by 7.6 years, from 78.2 in 2016 to 85.8 in 2070. The life expectancy at birth of woman in Slovenia is expected to increase by 6.3 years, from 83.8 in 2016 to 90.1 in 2070. The life expectancy at 65 years for men during the projection horizon is expected to increase by 5.4 years from 17.7 in 2016 to 23.1 years by 2070. For women, it is forecasted that the expected duration life at the age 65 will increase by 5 years, from 21.4 in 2016 to 26.4 years by 2070. The share of older cohorts in the population see also in Table 1. This ageing will significantly affect the increase in the share of older people in Slovenia.

*Table 1: Aging of population of Slovenia in the period 2016-2070*

| Share of population | 2016 | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---------------------|------|------|------|------|------|------|------|
| 65 +                | 18.7 | 20.7 | 25.2 | 28.3 | 30.6 | 30.2 | 28.5 |
| 80 +                | 5    | 5.6  | 6.9  | 9.8  | 11.4 | 12.9 | 13.5 |

source: EC, 2017

The aging of the Slovenian population increases the number of people who depend on the help of others to carry out their daily activities, at the same time influencing the demand patterns of built spaces due to the different needs of older citizens with respect to the needs of free movement in apartments and contacts with the environment. The reasons are in the reduction of the functional capacities of the elderly people who wish to stay as long as possible in their own home, but the obstacles of their built environment are preventing them to live independently.

A study by Claudia Wood (2017) provides evidences of the strong relationship between the adequacy of housing for older people and the health of older people, which shows an extremely strong contingency. There are many studies on the relationship between inadequate housing and the increase in falls, cardiovascular diseases and the mental health of older residents. Research confirms the impact of specialized housing for older people on improving the physical and mental health of residents and reducing the cost of health services, even in half.

How to best fund the cost of living, accommodation and long-term care of elderly people with declining functional abilities have become very topical issues in recent years. The key issue in the funding debate is how residents can finance their living expenses and additional housing costs, and how much they need to be financed from public funds or public insurance schemes to provide them the proper built environment. To respond to this challenge, the EU Commission and the Member States published a series of recommendations and acts, but there is not much written about how to support the adaptation of built-up areas to the aging population of municipalities. In order to preserve a vital society in vital European regions, it is necessary to develop new economic and social programs enabling new accommodation and care program options, and developing a new type of facility management in urban areas. The housing needs of older people are satisfied if the apartment is specially designed to fulfil the physical, emotional, recreational, health and social needs of the older cohorts. In the European Union, Member States are responsible for the planning, financing and management of social protection systems for the aging population. In their reform efforts, the European Commission recommends to the Member States three long-term objectives that need to be implemented in parallel:

- To ensure a good access to healthcare and social services, while a better urban infrastructure for these services is needed;
- Improve the quality of care, while the network of this care should be built in an optimal way,
- To ensure the sustainability of funding. In this context, the important question is how to ensure the sustainable financing of the older population (EC, 2014).

Proper housing is the basic need of the population. This is not just about the right of the naked walls and the roof over the head, but it is a shelter for the survival and protection of human dignity. An apartment provides a privacy and a general sense of personal space. Proper and adequate housing forms the core of the housing right (Drobež, Bogataj, 2016). When the elderly experience significant decline of functional capacities, the appropriateness of the home, where she/he previously lived with her/his relatives and is adapted to the needs of younger families, is reduced. However, when the old person moved to institutional care, she/he lost some important dimensions of housing rights that protected her/his privacy and dignity at his home. It is estimated that in the European Union more than 4 million older people live in long-term care facilities where they are separated from their communities in which they have spent much of their lives (EC, 2018). Such institutions were originally set up to provide physical support to mitigate disability, providing food and shelter care.

But now it is proven that they cannot provide the human of all those rights, services and amenities offered by their own home. In its latest documents, the European Union recommends that Slovenia begin the process of de-institutionalization of the elderly persons which would otherwise spent last years of their life in nursing homes, and thus obliges Slovenia to develop basic infrastructure and community services for the elderly citizens. In such communities, the home of the elderly is his own home, regardless of whether the apartment is owned by resident or rented, and it retains all the benefits and protection afforded by the housing right (see: Drobež, Bogataj, 2016). The European Social Charter and European Convention on Human Rights (see Council of Europe, <https://www.coe.int/en/web/turin-european-social-charter/-european-social-charter-and-european-convention-on-human-rights>) guarantee the rights of older people to freely choose their own lifestyle and live independently.

On the other hand, in Slovenia, the Constitution does not devote a special article regarding the rights of the elderly persons. We believe that special attention should be paid to persons with a significant decline in their functional capacity which are therefore dependent on the help of others, including in the framework of the right to adequate housing (Article 78 of the Constitution). This right belongs to a set of social rights that do not operate on the basis of generally recognized minimum standards, and therefore their ambiguity and flexibility could affect their effectiveness (Drobež, Bogataj, 2016). However, it can be suspected that due to the vulnerability of the elderly, the decline in their functional capabilities would result in inappropriate housing.

#### **4.1.3. Obligation of municipalities to organise and co-finance home assistance**

Home assistance (homecare) is a social welfare service intended for beneficiaries who have their own dwelling and proper living conditions in their own living environment and are not able to care and provide for themselves and also their relatives cannot provide proper care for them, due to their age or serious disability. In the context of municipality level homecare, there are various forms of organized assistance and support to replace, at least for a specific period of time, the need for institutional care in nursing home. The service is adapted to the needs of each beneficiary and includes assistance in basic daily tasks, household assistance and assistance in maintaining social contacts.

In accordance with Article 43 of the Social Welfare Act (Official Gazette of the Republic of Slovenia, No. 3/07 - official consolidated text, ZSV), the municipality is obliged to provide a network of public service for home assistance. The municipality chooses the service provider on its territory, the municipality agrees to the price of the service, and defines the level of its subsidy. The municipality can also influence the level of the price of the service paid by the user. The ZSV also stipulates that at least 50% of the costs of home assistance is financed from the municipal budget. With the aging of Slovenian population, the costs of care for aging population are increasing and represent a growing burden on municipalities. In the article we will examine whether and where municipalities can find reliable additional sources for financing care for their aging populations.

#### 4.1.4. Municipal taxation and real estate

##### Municipal taxation

Public finances of the R.S. take place through four public finance budgets (Ministry of Finance, [http://www.mf.gov.si/en/areas\\_of\\_work/general\\_government\\_finance/public\\_finances/public\\_finance\\_budgets/](http://www.mf.gov.si/en/areas_of_work/general_government_finance/public_finances/public_finance_budgets/), 2018). The first and the largest is the State budget, which represents 37.2 % of public finances. Follows the Pension and invalidity fund (20.8 %), the Health insurance fund (10.5 %) and municipal budgets (7.7 %). Transfers between the four budgets need to be consolidated from each other. On this basis the so-called consolidated general government budgetary deficit or surplus is calculated. Municipal revenues are comprised of various sources (article 6 and 7 of the Financing of Municipalities Act, the Official Gazette of the Republic of Slovenia no. 123/2006, 57/2008, 36/2011 and 14/2015 - ZUUJFO): "The sources of financing for municipalities are the revenues of the municipal budget from real estate taxes, water vessel tax, real property transaction tax, inheritance and gift tax, gaming tax and other taxes, in accordance with the law governing a particular tax. Financial resources for the municipalities also include revenues from voluntary contributions, levies, fines, concession fees, payment for local services and others in accordance with the legislation that governs individual levies or in accordance with regulations adopted pursuant to law. Municipal revenue also includes the material and financial assets of the municipality, received donations and transfer revenues from the state budget and resources from the European Union funds. Financial resources also include revenue from income tax and other taxes, which are part of the state budget revenue in accordance with law for each financial year in the amount of the total municipal expenditure. One of the tax revenues is tax on property, which is a real property tax comprising of tax on real estate (property tax and the building land use charge) and other taxes for the use of goods and services, including fees for the maintenance of forest roads; see also data of the Ministry of Finance of the Republic of Slovenia (2018).

This chapter focuses only on the revenues from taxes on real estate and fees for maintaining forest roads, which will be replaced by the revenue from the new real estate tax. This new estate tax according to the annulled Real Property Tax Act (the Official Gazette of the Republic of Slovenia no. 101/2013 and 22/2014 – judgment of the Supreme Court) would replace the current property tax, the building land use charge and fees for the maintenance of forest roads. Due to the current inconsistencies in real estate taxation, the Slovenian government is preparing a new system of real estate taxation which will replace the current levies and overcome the weaknesses existing under the current taxation system.

Weaknesses of the current taxation system are: disparities in the taxable objects, disparities in the taxpayer criteria, non-market methods of determining the tax base, different ways of determining the tax base and the tax amount, and differences in identifying tax exemptions and relief. The property tax and the building land use charge are often the subject of complaints; the municipal ordinances are often subjected to constitutional complaints and consequently annulments. Some of the real estate is not even subject to taxation because the municipal databases are incomplete and not up to date. It follows from the above, that the current system does not provide sufficient tax revenues to municipalities and does not provide taxation which would have an added impact on the efficiency and stability of municipalities

In Slovenia, the proportion of revenue from real estate taxation in gross domestic product and tax revenues is very low compared to other European countries. Režek (2004) argues that the introduction of a new real estate tax requires a clear-cut understanding of reasons, objectives and the manner. He emphasises that this is important in order to achieve the necessary degree of the political consensus, social justification and efficiency of the new tax system. In fact, one of the basic rights of taxpayers is their prerogative to require clarity of governmental objectives and ability to monitor the implementation and fulfilment of those objectives.

The Republic of Slovenia highlights the welfare of each individual as the central objective of social development, whereby changes in economy and society are focused on raising the welfare of current and future generations as stated also in Slovenian Development Strategy 2030 (Government of the Republic of Slovenia, 2017). The changed real estate taxation will influence the amount of municipal revenue used for financing investments in economic and social infrastructure, needed to increase the welfare of each individual.

### **Current real estate fees and other levies being replaced with the new real estate taxes**

Slovenian property tax system consists of three types of duties on possession of real property, those are property tax, building land use charge, property tax and fees for maintaining forest roads (Ministry of Finance of the Republic Slovenia, 2018; Financial administration of the Republic of Slovenia, 2018; Act on Forests, the Official Gazette of the Republic of Slovenia no. 30/93, 56/99 – ZON, 67/02, 110/02 – ZGO-1, 115/06 – ORZG40, 110/07, 106/10, 63/13, 101/13 – ZDavNepr, 17/14, 24/15, 9/16 – ZGGLRS and 77/16; Decree on distribution of the fee for the maintenance of forest roads, the Official Gazette of the Republic of Slovenia no. 42/15):

**a) Building land use charge.** The charge for the use of a building land is levied on vacant building land based on the area of the building land planned for building, and for constructed building land based on the useful area of the residential house or business premises thereon. Charge is set by the building land act and by ordinances in the municipality where the real estate is located. The size of the charge is determined with regard to the purpose of use (industrial, commercial, residential, etc.), the site or location (central urban, suburban, etc.), the utilities used by the building, and the utilities potentially available to the building. Exemptions are set for land and buildings used by the army, churches, embassies and international organizations, for temporary or new buildings or apartments for five years, partial or full exemption for people with low incomes, buildings or apartments for five years, partial or full exemption for people with low incomes, building land planned for public infrastructure (health, social security, schools, culture, science, sport and public administration, etc.) and developed building land under public infrastructure.

**b) Property Tax** is levied on premises such as buildings and parts of buildings, including apartments, garages and secondary homes. The taxpayer is the individual who is the actual or beneficial owner of the premises. The taxable base for premises is the value ascertained according to special criteria issued by the government and local communities. Value of building or premises are determined under the rules on the criteria and method for determining the value of houses and apartments and the points system. The value of a building depends on the number of points, which depends on the useful area, the quality of construction, the age, and other elements, and the value of the points themselves. The tax rate for premises depends of the type of property and its value. The tax rate for dwellings varies from 0,10 % to 1 % of the value. The tax rates on premises used for rest and recreation are in the range from 0,20 % to 1,50 %. The tax rate for business premises varies from 0,15 % to 1,25 %. For business premises that are not used for attendant activities or are not rented, the tax rate is increased by 50 %.

Exemptions to the real property tax include:

- Buildings of less than 160 square meters;
- Buildings used for agricultural purposes;
- Business premises used by the owner or user for business activity;
- Cultural or historical monuments.

In addition, there is a temporary exemption for 10 years to taxpayers who own a newly constructed building or repaired or renovated buildings, if the value of these buildings has increased as a result of renovation by more than 50 %. For a taxpayer with more than three family members who live in the owner's house, the tax decreases by 10 % for the fourth and every additional family member.

**c) Fees for maintaining forest roads.** The fees for maintaining forest roads is levied on forest, which has forest roads according to date of Slovenia Forest Service. The taxpayer is legal person or individual who is owner of forest. The taxable base for fees depend on cadastral income and density of forest roads issued by the government on the base of Act on Forests. Revenues of the fees for maintaining forest roads are used for maintaining forest roads.

### **The New Real Estate Tax According To The Annulled Real Property Tax Act**

The real estate tax is an important source of municipal revenue in most European countries; the same is predicted for Slovenia. Real Property Tax enforced with 1 January 2014 replaced all existing taxation of real estate in Slovenia by abolishing all previous legislation. However, The Real estate Act was annulled by Slovene Constitutional Court in March 2014. The adopted and later annulled Real Property Tax Act (the Official Gazette



of the Republic of Slovenia no. 101/13, 22/14) would cause differentiated taxation of real estate based on the generalized market value. Municipalities are allowed to set a tax rate within the lower and upper limit fixed by law.

### The Change In Taxation Of Real Estate In Slovenia

The study analyses the impact of the change in taxation of real estate in Slovenia. We discuss the impact of changed municipal taxation policy according to the annulled Real Property Tax Act. We calculated the revenues of current levies for real estate and the revenues according to the new real estate taxation system. The data on municipal revenue of current levies for real estate was acquired from the Ministry of Finance of the Republic of Slovenia. For the calculation of municipal revenues of the new real estate tax we use the tax rates for annulled Real Property Tax Act and generalized market value acquired from the Database of the Surveying and Mapping Authority of the Republic of Slovenia. All data are based on the regulations and plans in 2015.

*Tabele 2: Revenues from current levies and the new real estate taxation system*

|                                                              | Revenue from the current levies<br>(building land use charge,<br>property tax and fees for the<br>maintenance of forest roads) | Revenue from the new real estate<br>tax according to the annulled Real<br>Property Tax Act and generalized<br>market value |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Revenues [Eur]                                               | 202.099.733,41                                                                                                                 | 329.987.379,81                                                                                                             |
| Average per Slovenian municipality<br>(212. municipalities ) | 97,96                                                                                                                          | 159,95                                                                                                                     |

*Note: All data are based on the regulations and plans in 2015. The expected increase of the revenues is 63,2%*

Changes in real estate taxation generally have quite an impact on the increase of municipal revenue. Real estate tax therefore could encourage the local governments to make larger investments in more favourable future use of real estate, thereby providing financial benefits or better living conditions for taxpayers (and hence voters). Municipalities are obligated to manage their revenues in such a way as to offer public services (Pichler Milanović et al., 2008) and create conditions that will ensure a high-quality living environment (Nared et al., 2016). Therefore, it might be useful to highlight the importance of fiscal policy. Taxation significantly affects the volume of municipal revenue while providing municipalities with the resources needed to invest in infrastructure and other spatial structures. After all, a successful fiscal policy that leads regions and local communities along the path of balanced and environmentally friendly long-term growth is also important for their harmonious transport and environment-related development (Bogataj and Bogataj, 1995; Bogataj, 2000).

#### 4.1.5. Organisation and financing of homecare on municipality level

Now we would like to turn attention to the question what the older inhabitants of Slovenia, who had years and years participated to build the real estate of Slovenian Communities, expect from the local government and their community, when their functional capacities decrease so much that they need a help of others. The research of preferences regarding dwelling and services for older adults who are dependent on the help of others surveyed 198 recipients of long-term care in homecare in four Slovenian municipalities. (Kavšek & Bogataj, 2016, pp. 1-12). The research looked at whether users of home care services could still live at home after significantly reduction of their functional capacities, according to the Slovenian standards of organization the municipality's home assistance, it means like available now. The results of survey of three groups of respondents in three different municipalities on preferential dwelling and services were the following: 44.4% of the older adults would like to stay in their old home in any case, 39.7% of the older adults want to live in sheltered housing units, 1.6% in the retirement community, which is not available in Slovenia now, 12.7% of respondents would like to remain completely independent, so they would not be included in any community, but would need the ground floor apartment close to the city so that the services would be good enough, only 1.6% respondents would go to a nursing home.

In Slovenia currently, there are no Retirement communities, and therefore there is little knowledge of them among Slovenian citizens. Therefore, only small number of respondents (1,6%) considered that by moving to retirement community they would be able to protect their independence and dignity. But we suppose that the number of similar answers would be much higher if the elderly citizens would know more about such possibility.

Current capacity of Slovenian nursing homes is 20 602 beds. The demand exceeds the supply by 6 944 beds. At the end of year 2016 there were 7200 older adults included in municipality home assistance program. Part of residents of nursing homes (at least those in the category of care 1 and 2 – around 20%) could be moved to community assisted living facilities which would release around 4000 beds in nursing homes for those in need of more intensive care. Also part of older adults included in homecare would move to community assisted living facility if they would have a possibility. This means that currently there is the potential demand for between 7000 and 12000 assisted living housing units in the communities.

In the next 30 years the number of older adult will rise by factor 2.23. If Slovenia will not develop new capacities in Nursing Homes, that implies that municipalities will need to develop 40.000 community assisted living housing units. In the case that Slovenia will increase the capacities of nursing homes by 20% 36.000 new assisted living housing units will need to be developed by Slovenian municipalities or participate in better construction of their current homes and costly daily care and night care network, which is far more expensive as to build community assisted living housing units. In any case, Slovenian municipalities need to invest part of increase in property tax in community assisted living facilities and age-friendly environment with a proper network of caregivers, which costs depend on a dispersal of old people in the communities.

Currently the cost of building square meter of residential building is 1000 EUR. If we suppose that proper assisted living housing unit has 32 m<sup>2</sup> and the communal space of retirement community takes 12m<sup>2</sup> than investment in one assisted living housing unit in retirement community would be 50.000 EUR excluding land and building permit fee. In the case that municipalities would provide land and waive building permit fee the investment in 36.000 assisted living housing units would be 1.8 billion EUR. To develop such capacities municipalities would need to invest 60 mio EUR per year in the next 30 years. This implies that less than 50% of increase in municipal revenue according to new real estate tax proposal needs be invested in assisted living facilities and other built environment to provide for the homecare of aging population of Slovenian municipalities.

Some increase of revenue also needs to be invested in age-friendly environment of the municipality so that environment is safe for the older residents. Cost – benefit analysis is needed for the best structure of investment in:

- (a) adaptation of current homes of seniors and provision of homecare network (which is costly),
- (b) investments in community care where each resident has his housing rights in owned or rented units and
- (c) investments in nursing homes .

The investments should be calculated together with operational costs and their net present value should be known. In this concept we should not forget on the conclusion of Claudia Woods (2017) that living in a well organised retirement community reduce the healthcare costs for 50%. It means that it would be advisable that also health care budget participate a part to investments in the community retirement homes with low or no participation of older inhabitants, which would rise availability of these facilities to all very old cohorts.

#### **4.1.6. Conclusion**

This paper provides rough calculations regarding possible solutions and sources of financing development of assisted living facilities and age-friendly environment that is necessary to enable aging residents of Slovenian municipalities to age in their communities where they have been living for most of their life and therefore postpone the move to a nursing home. Based on the results of the research we can conclude that more than 40% of Slovenian pensioners want that municipalities start investing in housing units suitable for assisted living of their residents so that such dwellings would be financially accessible also to older adults with limited means.

According to studies of Wood (2007) the living environment in community retirement facilities like sheltered housing or retirement villages is decreasing the probability of falls and implies substantial savings for the national health systems. Age friendly environment and organised community presents lower risk of falls or other forms of accidents and less loneliness which implies higher quality of life of residents of community retirement facilities and reduce the costs of healthcare substantially. Currently Slovenian municipalities do not offer to their residents enough opportunities to move to subsidised assisted living housing units. In general, there is no significant difference in the percentage of those who would like to stay in an existing home, and those who would like to relocate, but not to a home for the elderly. Many of those, who would like to stay say so because they have not enough income to cover the costs of move. The percentage of those who would like to relocate to the home of older people, if not yet present, is very low (1.6% in the sample).

Elderly people may receive intensive long-term care only in long-term care facilities. If the municipalities will not develop proper community assisted-living facilities, almost half of the elderly will be disappointed, because they will have to come to terms with going to a nursing home.

A better more age friendly built environment enables the older adults to be more mobile and provide social care during in the community, in existing housing units, which means that several older people can maintain their independence. Local communities should think about the possibility of enable elderly people to stay longer at home or to develop affordable housing in the community where they live. However, this way of servicing the elderly is very expensive for both families and municipalities, if this development of social infrastructure does not go hand in hand with the support of the European Investment Bank with appropriate plans for lower risk exposure. Costs of home care and home care services in existing homes are particularly high in rural areas where travel costs for care providers for elderly care have increased (Bogataj, Szander and Ros-McDonnell, 2015, pp. 59-80) and where local authorities could not cover half of the service costs, as required by law.

When the number of elderly people involved in long-term care will triple, this problem will be even greater. Other options, not just expensive home care or expensive housing in private high-rise residential complexes (owned or rented by elderly residents), need to be studied. It is necessary to consider measures for financing through public or private investments in affordable housing for all and therefore to build the proper social infrastructure in each Slovenian municipality.

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## 4.2. The study of factors that influence the apartment prices in the region of city center, Dardania, Ulpiana and Mati in the city of Prishtina

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### 4.2.1. Abstract

The purpose of this study is to identify the key factors that influence the apartment prices in three regions of Prishtina, which are: city center, Dardania, Ulpiana, and Mati. The study is important for the community of real estate appraisers since they will benefit from this study by knowing exactly the level of impact of key factors identified on apartment prices in the three regions of Prishtina.

The present study raises the main research question: Which are the main factors that influence the apartment prices in the region of city center, Dardania and Mati in the city of Prishtina?

The methodology of study is quantitative. The independent variables selected in the present study are: location, size of apartment, the floor, and year of construction.

The research instrument are the real estate transactions that occurred in these areas in the period of 2017-2018 confirmed by notary services in Prishtina. The source of real estate transactions is the Ministry of Finance of Republic of Kosovo, Department of Property Taxes

The objects of study are 20 contracts in each region of the study subject to multiple regression analysis in SPSS to quantify the level of impact of the independent variables on the apartment prices in the selected regions of Prishtina in the period 2017-2018.

In the city center and Mati 1 the location has the greatest impact followed by the year of construction, floor, and lastly the size. In Ulpiana region and Dardania, the multiple regression shows that the floor has the greatest impact, followed by location, year of construction and size.

**Keywords:** Location, Floor, Year of construction, Size, Apartment prices, Prishtina

#### 4.2.2. Introduction

The housing prices are influenced by many factors, including demography, interest rates, economy, purchasing power and other external factors (Ngyen, 2014). In addition, the key external factors that influence the real estate prices are location, surface, the quality of neighbourhood, age of building, the floor, number of bedrooms, technical structure of the building, and the surface of the parcel (Kalia, 2013).

The main factor that influences the housing prices is the location. Bourassa et al. (2003) points out that the geographical location of real estate has the largest effect on the price of real estate. In addition to geographical location, other authors also look at the structural location of apartments whether the apartment is located between two blocs of apartment complex (Cebula, 2009). To this end, Bourassa et al. (2003) found that the surface of apartment has an effect on the total price of the apartment by 5 percent. On the other hand, Lisi dhe Iakobini (2013) point out that the surface of the parcel influences the apartment prices by 17 percent. In this regard, in analyzing the housing market of Helsinki, Bello (2009) found that the increase of surface of apartments by one square meter increased the price of apartment by 1.3 %, if other variables are held constant.

With regards to the floor in which the apartment is located, Ayan dhe Erkin (2014) find that apartments situated on the first floor of apartment complex are valued by 8.4 percent less than the apartments that are situated on upper floors of the same building.

With regards to the age of the building, Rodriguez and Sirmans (1994) find a negative correlation between the age of building and the price of apartment. To this end, Cebula (2009) finds that a new construction apartment is valued with the premium price of 31 % more than the old construction apartments. Ottensmann et. al (2008) finds that the age of the building decreased the apartment price by 0.24 percent.

As far as number of bedrooms is concerned, Lisi and Iakobini (2013) find that an additional bedroom in the apartment increases the price of apartment by 4.57 percent, whereas an additional bathroom increases the price of apartment by 10 percent (Sirmans and Macpherson, 2003). In addition, Bello (2009) who analyzed the apartments market in Helsinki points out that an additional bedroom increases the price of apartment by 4.8 percent, if other variables are held constant.

With regards to the view of the apartment, Bourassa et al. (2003) points out that the view of apartment towards river or sea increases the price of apartment by 10 percent.

Based on the reviewed literature, the study formulates the following research question: **Which are the main factors that influence the apartment prices in the region of city center, Dardania, Ulpiana and Mati in the city of Prishtina?**

The main hypothesis is formulated as follows:

Hypothesis: Location is the main influencing factor in apartment prices of city center, Dardania, Ulpiana and Mati in the city of Prishtina

#### 4.2.3. Research method

The present research uses quantitative method to measure the key factors that influence the prices of apartments in four main regions of Prishtina city. Burns and Grove define quantitative research as a formal, objective, systematic process to describe and test relationship and examine cause and effect interactions among variables (Burns and Grove, 2005). The present study uses the multiple regression analysis to measure the effect of independent variables on the dependent variable, which is the price of apartment. Benjamin et al., (2006) points out that multiple regression analysis is an excellent method for massive appraisal of real estate and for measuring the effect of various factors on the prices of real estate.

#### Research instrument

The research instrument selected for this study is sales contracts that were concluded in 2017 and were recorded for tax purposes by the Department of Property Taxes of Ministry of Finance of Republic of Kosovo. The sales contracts were subject to multiple regression analysis in SPSS.



### Research variables

The research variables selected as independent variables in this study are: distance from the center in km, surface in m<sup>2</sup>, floor, legal status, and year of construction. The legal status. The research variable distance in km from the city center is the distance from the main hotel in Prishtina called hotel Grand. Hotel Grand represents a cultural memory identity of city of Prishtina.

### Research protocol

The research protocol used for the present study is official requests made to the Chamber of Notaries for verified sales transactions, which refused the request due to confidentiality purposes. On the other hand, the same request received a positive response from the Department of Property Taxes of Republic of Kosovo.

### Research objects

The number of contracts that were subject to this analysis were extracted from the database of sales transactions that were recorded for tax purposes. The number of all sales contracts per asset type was presented below in Table 1.

*Table 1: Number of sales contracts per type of real estate asset class throughout Kosovo in the period 2016-2017*

|                        | Number of transactions | Number of transactions |
|------------------------|------------------------|------------------------|
| Type of asset          | 2016                   | 2017                   |
| Vacant land            | 3,834                  | 2,857                  |
| Apartments             | 1,034                  | 824                    |
| Residential houses     | 120                    | 102                    |
| Commercial real estate | 102                    | 68                     |

*Source: Department of Property Taxes, Ministry of Finance of Republic of Kosovo*

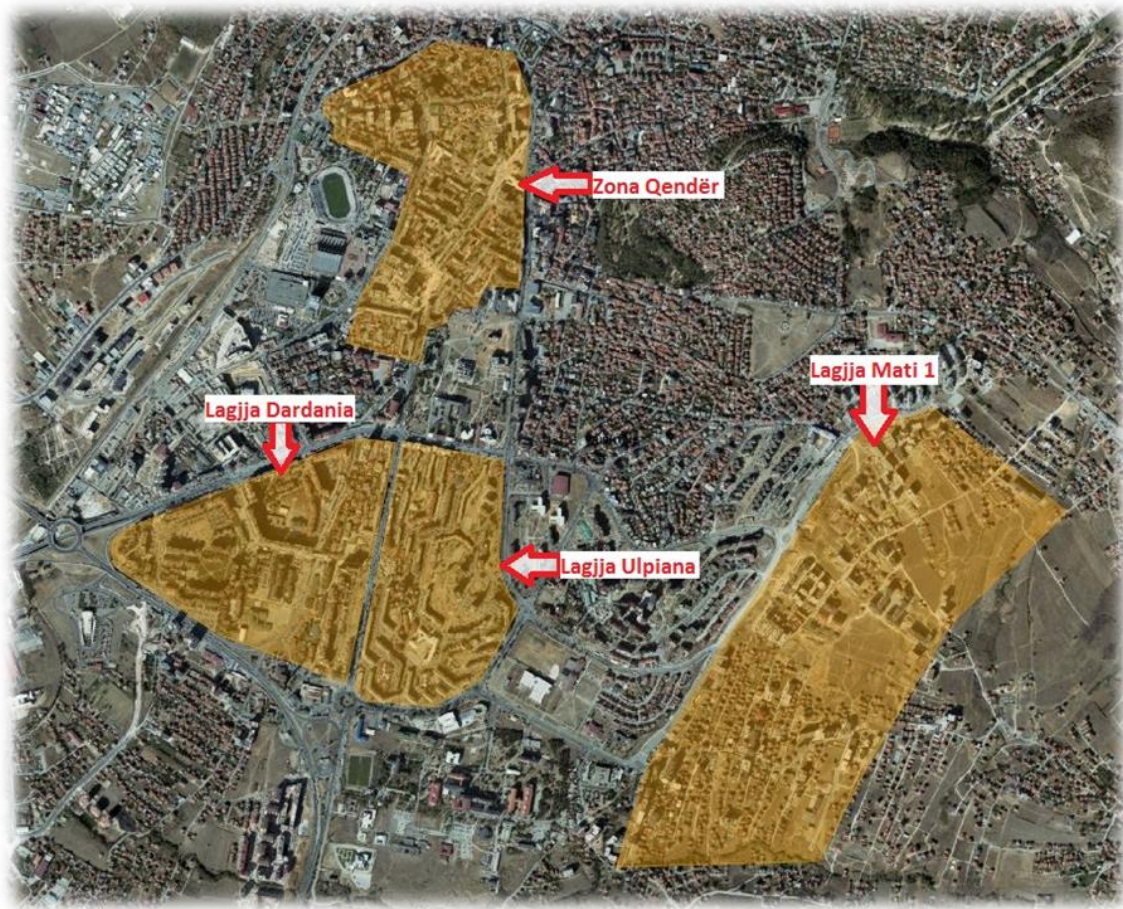
Out of 824 contracts the Prishtina city recorded 208 transactions of apartments. Out of 208 transactions, 60 were removed from the analysis because they represented outliers because of fictive contracts not representing the real market value in those zones. The outliers were removed because they deviated from the mean prices of those zones by 50 %.

Out of 140 sales transactions, 80 were selected to represent the abovementioned regions of city of Prishtina. For each region, the study selected 20 representative contracts, which represent an excellent sample.

#### 4.2.4. Research results

The research results have been presented by the region analyzed of the city of Prishtina. The map of analyzed regions of city of Prishtina have been presented in Figure 1.

Figure 1: Geographical zones of study



#### Research results for city center

The sales transactions of city center were subject to descriptive statistics analysis in SPSS, which has been presented in Table 2.

Table 2: Descriptive statistics of city center

|                               | N  | Minimum | Maximum | Mean      | Std. Deviation |
|-------------------------------|----|---------|---------|-----------|----------------|
| Distance from the center (km) | 20 | .03     | 1.10    | .5000     | .37929         |
| Surface (m <sup>2</sup> )     | 20 | 40.0    | 108.0   | 74.005    | 19.1984        |
| Floor                         | 20 | 0       | 7       | 2.80      | 1.989          |
| Legal status                  | 20 | 0       | 1       | .85       | .366           |
| Year of construction          | 20 | 4       | 5       | 4.15      | .366           |
| Price per m <sup>2</sup>      | 20 | 930     | 2500    | 1771.30   | 491.033        |
| Price of apartment            | 20 | 71500   | 220000  | 128365.10 | 42200.682      |
| Valid N (listwise)            | 20 |         |         |           |                |

Source: SPSS, 2015

The table above shows that the mean distance of analyzed apartments is 500 m with standard deviation of 0.37 km, which shows that majority of analyzed apartments were within the inner radius of city center. In addition, the mean surface of apartments analyzed is 74 m<sup>2</sup>, and mean prices for m<sup>2</sup> of analyzed apartments in the city of center of Prishtina is 1770 €/m<sup>2</sup>.

Next the study used model summary in SPSS to measure the effect of selected independent variables on the prices of apartments in city center of Prishtina. The model summary has been presented in Table 3.

*Table 3: Model summary for city center*

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |          |     |     |               |
|-------|-------------------|----------|-------------------|----------------------------|-------------------|----------|-----|-----|---------------|
|       |                   |          |                   |                            | R Square Change   | F Change | df1 | df2 | Sig. F Change |
| 1     | .833 <sup>a</sup> | .695     | .613              | 305.438                    | .695              | 8.526    | 4   | 15  | .001          |

a. Predictors: (Constant), Years of construction, Floor, Surface (m<sup>2</sup>), distance from the center (km)

Based on R square, the study concludes that 69.5 percent of apartment prices in the city center of Prishtina is effected by the selected variables and the remainder by other exogenous variables that are not subject to the present analysis.

Next, the study used the multiple regression analysis to measure the effect of independent variables on the price per m<sup>2</sup> of apartments in city center. The multiple regression analysis for city center of Prishtina has been presented in Table 4.

*Table 4: Multiple regression analysis of city center of Prishtina*

| Coefficients <sup>a</sup> |                           |                             |            |                           |        |      |
|---------------------------|---------------------------|-----------------------------|------------|---------------------------|--------|------|
| Model                     |                           | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig. |
|                           |                           | B                           | Std. Error | Beta                      |        |      |
| 1                         | (Constant)                | 4838.002                    | 844.420    |                           | 5.729  | .000 |
|                           | Distance from center (km) | -681.280                    | 210.687    | -.526                     | -3.234 | .006 |
|                           | Surface (m <sup>2</sup> ) | -1.627                      | 4.015      | -.064                     | -.405  | .691 |
|                           | Floor                     | -76.469                     | 36.672     | -.310                     | -2.085 | .055 |
|                           | Year of construction      | -576.281                    | 229.394    | -.430                     | -2.512 | .024 |

a. Dependent Variable: Price per m<sup>2</sup>

The multiple regression analysis of the city center shows the highest beta coefficient for location (distance in km from Hotel Grand as a reference point), which is (-.526). The beta coefficient shows that the location has the largest effect on the price per m<sup>2</sup> of apartments. The second most important variable is the floor with the beta coefficient (-.310), which shows that lower floors have a larger effect on the price of apartment than the upper floors of the apartment building. Also, the year of construction has a beta coefficient of (-.430), showing that the age of the building has a moderate effect on the prices of apartments in city center of Prishtina. The

surface of the apartment has the least effect on the price of apartment with the beta coefficient of (-.064). The legal status of the building has been removed from the analysis, since all the buildings in the city center of Prishtina have a resolved legal status and are registered in the Cadaster and also all apartment buildings in city center of Prishtina are old construction buildings built during communism.

### Research results for Ulpiana

The sales transactions of Ulpiana were subject to descriptive statistics analysis in SPSS, which has been presented in Table 5.

*Table 5: Descriptive statistics of Ulpiana*

|                           | N  | Minimum | Maximum | Mean     | Std. Deviation |
|---------------------------|----|---------|---------|----------|----------------|
| Distance from center (km) | 20 | .50     | 1.40    | 1.0125   | .26050         |
| Surface (m <sup>2</sup> ) | 20 | 34.5    | 100.0   | 58.255   | 15.5652        |
| Floor                     | 20 | 0       | 5       | 2.65     | 1.387          |
| Legal status              | 20 | 1       | 1       | 1.00     | .000           |
| Year of construction      | 20 | 4       | 4       | 4.00     | .000           |
| Price per m <sup>2</sup>  | 20 | 1193    | 2091    | 1531.27  | 237.310        |
| Price of apartment        | 20 | 52000   | 140000  | 88410.00 | 23867.483      |
| Valid N (listwise)        | 20 |         |         |          |                |

The table above shows that the mean distance of analyzed apartments is 1 km with standard deviation of 0.26 from reference point (Hotel Grand), which shows that majority of analyzed apartments were close to the center. In addition, the mean surface of apartments analyzed is 58 m<sup>2</sup>, and mean prices for m<sup>2</sup> of analyzed apartments in the Ulpiana region of Prishtina is 1531 €/m<sup>2</sup>.

Next the study uses model summary in SPSS to measure the effect of selected independent variables on the prices of apartments in city center of Prishtina. The model summary has been presented in Table 6.

*Table 6: Model summary for city center*

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .638 <sup>a</sup> | .407     | .296              | 199.143                    |

a. Predictors: (Constant), Years of construction, Floor, Surface (m<sup>2</sup>), distance from the center (km)

Based on R square, the study concludes that 40.7 percent of apartment prices in the Ulpiana region of Prishtina is effected by the selected variables and the remainder by other exogenous variables that are not subject to the present analysis.

Next, the study used the multiple regression analysis to measure the effect of independent variables on the price per m<sup>2</sup> of apartments in city center. The multiple regression analysis for Ulpiana region of Prishtina has been presented in Table 7.

Table 7: Multiple regression analysis of Ulpiana region of Prishtina

| Coefficients <sup>a</sup> |                           |                             |            |                           |       |
|---------------------------|---------------------------|-----------------------------|------------|---------------------------|-------|
| Model                     |                           | Unstandardized Coefficients |            | Standardized Coefficients | Sig.  |
|                           |                           | B                           | Std. Error | Beta                      |       |
| 1                         | (Constant)                | 1831.731                    | 232.576    |                           | 7.876 |
|                           | Distance from center (km) | -104.264                    | 181.456    | -.114                     | .574  |
|                           | Surface (m <sup>2</sup> ) | 2.064                       | 3.476      | .135                      | .561  |
|                           | Floor                     | -118.921                    | 38.386     | -.695                     | .007  |

a. Dependent Variable: Price per m<sup>2</sup>

In Ulpiana region, the floor has the highest beta coefficient of ( -.695), showing that the lower floors have larger effect on the price of apartment than upper floors. The second most important variable with high beta coefficient is the surface with beta coefficient 0.135. The least important variable effecting the prices of apartments in Ulpiana region is the distance from center (Hotel Grand) with the beta coefficient of ( -.114). The legal status of the building has been removed from the analysis, since all the buildings in the region of Ulpiana of Prishtina have a resolved legal status and are registered in the Cadaster and also all apartment buildings are old construction buildings built during communism. The year of construction variable was removed from multiple regression analysis since it produced very low results and was distorting the results of other variables, hence it was removed from analysis.

#### Research results for Dardania

The sales transactions of Dardania were subject to descriptive statistics analysis in SPSS, which has been presented in Table 8.

Table 8: Descriptive statistics of Dardania

|                           | N  | Minimum | Maximum | Mean     | Std. Deviation |
|---------------------------|----|---------|---------|----------|----------------|
| Distance from center (km) | 20 | .7      | 1.4     | 1.100    | .2492          |
| Surface (m <sup>2</sup> ) | 20 | 38.0    | 125.0   | 64.840   | 21.6578        |
| Floor                     | 20 | 0       | 11      | 4.45     | 3.316          |
| Legal status              | 20 | 1       | 1       | 1.00     | .000           |
| Year of construction      | 20 | 4       | 4       | 4.00     | .000           |
| Price per m <sup>2</sup>  | 20 | 967     | 1800    | 1252.95  | 237.930        |
| Price of apartment        | 20 | 45000   | 160000  | 79925.00 | 25557.096      |
| Valid N (listwise)        | 20 |         |         |          |                |

The table above shows that the mean distance of analyzed apartments is 1.1 km with standard deviation of 0.24 from reference point (Hotel Grand), which shows that majority of analyzed apartments were close to the center. In addition, the mean surface of apartments analyzed is 64 m<sup>2</sup>, and mean prices for m<sup>2</sup> of analyzed apartments in the Dardania region of Prishtina is 1,252 €/m<sup>2</sup>.

Next the study uses model summary in SPSS to measure the effect of selected independent variables on the prices of apartments in Dardania region of Prishtina. The model summary has been presented in Table 9.

*Table 9: Model summary for Dardania*

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .839 <sup>a</sup> | .705     | .649              | 140.915                    |

a. Predictors: (Constant), Kati, Siperfaqja (m<sup>2</sup>), Largesia me qender(km)

Based on R square, the study concludes that 70.5 percent of apartment prices in the Dardania region of Prishtina is effected by the selected variables and the remainder by other exogenous variables that are not subject to the present analysis.

Next, the study used the multiple regression analysis to measure the effect of independent variables on the price per m<sup>2</sup> of apartments in Dardania region. The multiple regression analysis for Dardania region of Prishtina has been presented in Table 10.

*Table 10: Multiple regression analysis of Dardania region of Prishtina*

| Coefficients <sup>a</sup> |                           |                             |            |                           |        |
|---------------------------|---------------------------|-----------------------------|------------|---------------------------|--------|
|                           |                           | Unstandardized Coefficients |            | Standardized Coefficients |        |
| Model                     |                           | B                           | Std. Error | Beta                      | t      |
| 1                         | (Constant)                | 2094.396                    | 205.180    |                           | 10.208 |
|                           | Distance from center (km) | -405.138                    | 165.168    | -.424                     | -2.453 |
|                           | Surface (m <sup>2</sup> ) | -1.425                      | 1.606      | -.130                     | -.887  |
|                           | Floor                     | -68.182                     | 11.816     | -.950                     | -5.770 |

a. Dependent Variable: Price per m<sup>2</sup>

In Dardania region, the floor has the highest beta coefficient of ( -.950), showing that the lower floors have larger effect on the price of apartment than upper floors. The second most important variable with high beta coefficient is the distance from the center with beta coefficient (-0.424). The least important variable effecting the prices of apartments in Dardania region is the surface, which has a negative beta coefficient of (-.130), showing that larger surfaces have a negative effect on prices of apartments in Dardania region of Prishtina.

#### **Research results for Mati region**

The sales transactions of Mati region were subject to descriptive statistics analysis in SPSS, which has been presented in Table 11.

*Table 11: Descriptive statistics of Mati*

|                           | N  | Minimum | Maximum | Mean   | Std. Deviation |
|---------------------------|----|---------|---------|--------|----------------|
| Distance from center (km) | 20 | 1.9     | 3.5     | 2.600  | .4801          |
| Surface (m <sup>2</sup> ) | 20 | 48.0    | 112.0   | 77.790 | 16.4877        |



|                          |    |       |        |          |           |
|--------------------------|----|-------|--------|----------|-----------|
| Floor                    | 20 | 1     | 10     | 4.75     | 2.425     |
| Legal status             | 20 | 0     | 1      | .10      | .308      |
| Year of construction     | 20 | 5     | 6      | 5.15     | .366      |
| Price per m <sup>2</sup> | 20 | 620   | 1325   | 863.11   | 170.790   |
| Price of apartment       | 20 | 36000 | 110000 | 67769.50 | 20874.014 |
| Valid N (listwise)       | 20 |       |        |          |           |

The table above shows that the mean distance of analyzed apartments is 2.6 km with standard deviation of 0.48 from reference point (Hotel Grand), which shows that majority of analyzed apartments were close to the center. In addition, the mean surface of apartments analyzed is 77 m<sup>2</sup>, and mean prices for m<sup>2</sup> of analyzed apartments in the Mati region of Prishtina is 863 €/m<sup>2</sup>.

Next the study uses model summary in SPSS to measure the effect of selected independent variables on the prices of apartments in Mati region of Prishtina. The model summary has been presented in Table 12.

*Table 12: Model summary for Mati*

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .753 <sup>a</sup> | .566     | .411              | 131.034                    |

a. Predictors: (Constant), Year of construction, Legal status, Distance from center (km), floor, surface (m<sup>2</sup>)

Based on R square, the study concludes that 56.6 percent of apartment prices in the Mati region of Prishtina is effected by the selected variables and the remainder by other exogenous variables that are not subject to the present analysis.

Next, the study used the multiple regression analysis to measure the effect of independent variables on the price per m<sup>2</sup> of apartments in Mati region. The multiple regression analysis for Mati region of Prishtina has been presented in Table 13.

*Table 13: Multiple regression analysis of Mati region of Prishtina*

| Coefficients <sup>a</sup> |                           |                             |            |                           |        |
|---------------------------|---------------------------|-----------------------------|------------|---------------------------|--------|
|                           |                           | Unstandardized Coefficients |            | Standardized Coefficients |        |
| Model                     |                           | B                           | Std. Error | Beta                      | t      |
| 1                         | (Constant)                | 1870.295                    | 573.561    |                           | 3.261  |
|                           | Distance from center (km) | -244.758                    | 69.418     | -.688                     | -3.526 |
|                           | Surface (m <sup>2</sup> ) | -1.621                      | 2.154      | -.157                     | -.753  |
|                           | Floor                     | -19.267                     | 14.020     | -.274                     | -1.374 |
|                           | Legal status              | -23.172                     | 102.014    | -.042                     | -.227  |
|                           | Year of construction      | -29.294                     | 91.991     | -.063                     | -.318  |

a. Dependent Variable: Price per m<sup>2</sup>



Since in Mati 1, there are old construction apartment buildings and new construction apartment buildings, the year of construction and legal status of buildings was also subject to multiple regression analysis as independent variables affecting the prices of apartments in that area. Many buildings in that area have the legal permit, but have not received yet the use permit. Despite of not having the usage permit, they are subject to sales transactions. In Mati 1, the distance from the center has the largest beta coefficient (-.688), whereas the floor is the second most important variable with the beta coefficient of (-.274). The surface, legal status and year of construction have a very low effect on the prices of apartments in Mati region of Prishtina.

#### **4.2.5. Conclusions**

The results of the study show that the distance from the center is the most important variable affecting the prices of apartments in the city center of Prishtina and Mati region of Prishtina, but not in the areas of Ulpiana and Dardania where the distance from the center is not the most important variable that affects the apartment prices. In these two areas the floor is the most important variable affecting apartment prices.

Thus based on the research results, the formulated hypothesis is only partially proven.

It is interesting that the distance from the center does not have the expected effect on apartment prices in all areas of Prishtina subject to this analysis as opposed to studies by Bourassat et.al (2003) and Cebula (2009) who argued that the effect of distance from the business center on prices of apartments is 10 %.

It is quite interesting that the lower floors have a larger effect on prices of apartments in Prishtina than upper floors as opposed to the upper floors that have larger effect on apartment prices in other countries as argued by Ayan dhe Erkin (2014). Even in countries such as China upper floors have a larger effect on apartment prices than lower floors (Chin, 2003).

The effect of surface on apartment prices in Prishtina as proven by the present study is from low to moderate as opposed to Wild (2009) who points out that the effect of surface on the prices of apartments is quite high.

The year of construction in Prishtina has a very low effect on apartment prices as opposed to other countries when the correlation between prices and age of the building has an U shape as argued by Bourassa et al. (2003) because of their historic character.

In conclusion, the findings of the present study are in line with other studies completed globally, except for the floor which has a contrary effect on the prices of apartment in Prishtina. This may not only be because of different cultural perception about the importance of upper floors versus lower floors, but also because of the very frequent electricity problems in Kosovo, which disrupt uninterrupted work of elevators in apartment buildings. In addition, the poor water infrastructure in the city of Prishtina, which is not able to supply the upper floors with sufficient quantity of water is another factor.

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### 4.3. The impact of Municipal Taxation and Revenues on the Bid Rent Curve Determined through Parameters of the Net Internal Migration

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#### 4.3.1. Abstract

Slovenia has no institutionalized intermediate level of government between the state and municipalities; therefore it is a useful approach to the bid rent curve analysis of the central places through the changes of parameters in a gravity model, where the municipalities are considered as the CBD and its zones around it. Namely, the municipalities represent essential cells for realizing regional development with specific development objectives at the state level, competing with the other municipalities in the state. The achievement of these objectives is strongly linked to the financing of municipalities, their economic power, taxation policy and stability of the economic and social system. One of the main factors affecting changes in internal migration is real estate taxation.

A successful fiscal policy leads regions, and local communities along the path of balanced and environmentally friendly long-term growth or a steady decline analysed through the bid rent curves. The paper discusses the impact of changes in the property taxes and municipal revenues on the bid rent curve and the real estate prices. Therefore, the indicators evaluated through the changes of parameters in a gravity model which are subject of the changed taxation policy gives a proper forecasting value of urban land rent and a bid curve derivatives.

The model derived here is based on the derivation of the normalised NE\_SIM model and proves of Janež, Bogataj, and Drobne (2016), who had proved, that the inter-municipal migration of Slovenia is supposed to be influenced, among other factors, by the taxation policy and revenues of municipalities. Also, we suggest the proper analysis of the changes of the bid rent curve, as it was previously derived by Bogataj, Tuljak-Suban, and Drobne (2011), where the fuzzy approach was also facilitated. We discuss the impact of changed municipal taxation policy on the bid rent curve according to the submitted but later annulled The Real Property Tax Act.

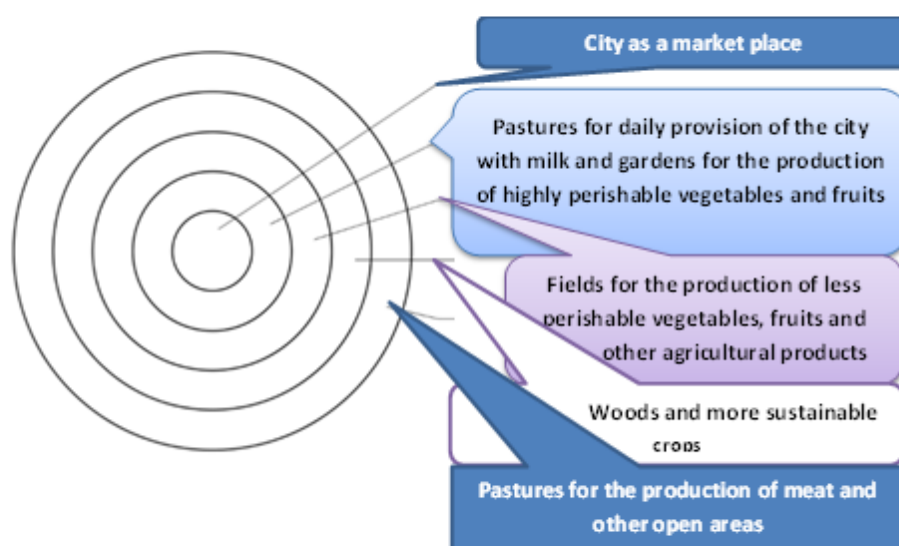
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**Keywords:** Bid rent curve, Real estate tax, Municipal revenue, The market value of residential real estates, Spatial interaction model, Internal migration

#### 4.3.2. Introduction

The pressing challenge of Slovenia and other EU states is to embark on the path of smart, sustainable and inclusive growth, to develop age-friendly urban environment and invest in the infrastructure and supply networks that will transform European cities to smart cities, creating jobs, wellbeing for older inhabitants who need a help of others, and enhancing competitiveness. In responding to this task, Europe faces large-scale, long-term investment needs, where housing and infrastructure investments represent a major part of the gross fixed capital formation. To support required policies and for evaluation of potential investments the general theory of land rent as a regulator of urban growth should be reconsidered, the behaviour of the bid rent curve should be better analysed. The impact of investments, as well as taxation on the monopoly position of central places, should be studied, and the taxation and investment decision should base on the models of attractiveness, stickiness and bid rent curve equilibrium analysis.

The bid rent theory is the basic theory in the social geography for supporting urban studies, developed by Alonso (1964). It bases on the von Thünen agricultural economics on the marginal productivity (fig.1), written in a mathematically rigorous principles (see edition 1910) and on one of the most important theoretic contributions to the Chicago School, named “Burgess Zones”, describing concentric circles of differing land use radiating from a cities’ central business district (CBD), which became a standard concept in urban demography. The theory refers to how the market price and demand for real estate decrease as the distance from the CBD increases. It states that different land users will compete with one another for land close to the city centre.



*Fig.1. Von Thünen's model of use of agricultural land*

Alonso was looking for a general market balance in urban land use, similar to Von Thünen's balance in agriculture. Households will select a location where their utility is maximum, that is, the location where the usefulness curve touches the price curve. Alonso (1964) similarly extends the housing concept to determine the location of an industry and market areas.

According to his game theory approach, equilibrium is supposed to be achieved when no user of the plot will be able to achieve greater utility or profitability by moving to another location or by buying more or less land.

Muth (1969) and Mills (1972), extended Alonso's model by combining land and capital in utility or profitability function influencing the final bid rent curve. This extension made it possible to analyze housing rent and transaction prices and capacity of facilities. Nice simplification is given by McDonald & McMillen (2007, p. 107).

As the slope of the bid rent curve determines accessibility to workplaces and other activities in a space (i.e. commuting costs as a complementary costs of the land use) and taxation additionally influence the slope as

presented in Bogataj and Bogataj (1995) the impact of differences in the commuting costs and taxation can also be observed through the gravity model.

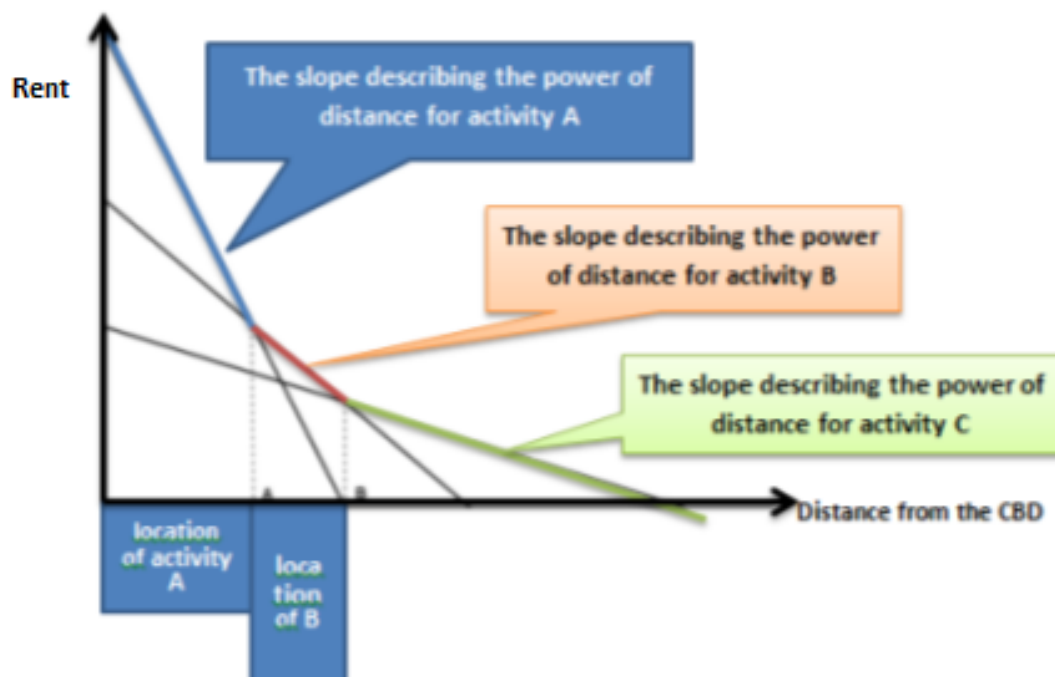


Figure 2: Urban land rent depending on the distance from the CBD in Alonso's bid rent theory, creating bid rent curve (bold).

#### 4.3.3. The impact of taxation on the slope of the bid rent curve

With fiscal policy, we can influence the demand and the bid rent slope (Bogataj and Bogataj, 1995), mostly because of the changed flows of migrants (Bahl, Martinez-Vazques and Youngman, 2010). For example, local communities, with their economic power, are attracting migrants and at the same time retaining existing inhabitants. Economic power, among other things, is also facilitated by the revenues of municipalities from which public services and investments in the social infrastructure are financed. Thus, the net result of the migration depends also on real estate taxes and the level of public services that people are asking. Therefore, the attractiveness of municipalities can be analyzed through demographic trends. Dealing with permanent relocations between Slovenian municipalities we can also study the changes in the bid rent curve of their central places. The migration is influenced by the indicators of the location of residence as well as the indicators at the location of possible immigration. Municipalities with different mechanisms influence the development of their area, and consequently further demographic trends. Empirical research enables the advance knowledge, foresight and forecasting direction of the effects of demographic trends (Janež, Bogataj, Drobne, 2016).

George (1948) included in his theory the impact of the relocation of the population to the land rent. He proved that one of the reasons for the increase in land rent was also an increase in the population due to immigration which was studied on the bases of developed asymmetric gravity model by Janež, Bogataj, and Drobne (2018). Revenues from land tax are supposed to be used in such a way that all land users will benefit from it through the services for residents being financed from these sources.

The model derived here is based on the derivation of the normalised NE\_SIM model and proves of Janež, Bogataj, and Drobne (2016, 2018), who had already proved, that the inter-municipal migration and commuting in Slovenia is supposed to be influenced, among other factors, by the taxation policy and revenues of municipalities. The proofs are based on the data for the year 2011. Based on the data for the year 2015 the authors here demonstrate the influence of land rent taxation, which consequently influences the size of the collected revenues of the municipalities and possibility of investments in the social infrastructure, on the slope

of bid rent curve. From this, it follows that it is important for municipalities to plan carefully the increase in net migration flows, which will increase the bid rent curve and, consequently, their revenues from the taxation of real estate and possibilities to invest in the municipality's infrastructure. Similarly, already Chun (1996) claims that migration is a means of achieving economic efficiency and equity, but did not present the advantages of the gravity models to find the shape of the bid rent curve.

With the approach described in Janež, Bogataj and Drobne (2016, 2018), the aim of our research is to calibrate the general interaction model of migrations between the municipalities of Slovenia for 2015, after the change of taxation on the basis of the provisions in the repealed Real Estate Tax Act (ZDavNepr, Official Gazette of the Republic of Slovenia, No. 101/2013 and 22/2014 - decree) and show the approach how to forecast the changes of the shape of the bid rent curve.

To analyze the simultaneous impact of the change in the taxation of real estate and the time distance on the constant net internal migration (stability of flows), we used the primary data obtained from Statistical Office of the Republic of Slovenia (SORS). Data on migration between municipalities of Slovenia were collected from the Central Population Register (CRP). At SORS we obtained data on the number of inhabitants, the number of registered unemployed persons, average gross personal income and the number of dwellings in the municipality. Data on revenues of municipalities were obtained at the Ministry of Finance of the Republic of Slovenia (MFRS). Data on the average price of dwellings and the estimated value based on the mass valuation of real estate in the municipality were obtained at the Surveying and Mapping Authority of the Republic of Slovenia (GURS). We summarized the time travel through the fastest route with a personal vehicle between centers of municipalities, by the procedure described by Drobne and Bogataj (2017). In order to calculate the revenues of municipalities in the case of the introduction of a new property taxation, we applied the tax rates from the provisions in the repealed Real Estate Tax Act - ZDavNepr (Official Gazette of the Republic of Slovenia, No. 101/13, 22/14) and the generalized market values of real estate, estimated value based on mass valuation of real estate (GURS). For estimates based on the mass appraisal of real estate we took the latest available data from 2017, other data are from 2015. Calibration of the model of migration was carried out for 2015 when there were 212 municipalities in Slovenia; the register of municipalities is available at SORS.

Based on the approach described in Janež, Bogataj, and Drobne (2016), we first calibrated the expanded spatial interaction model of inter-municipal migrations in Slovenia for 2015. The approach used is derived from the previous simple model of Cesario (1973, 1974), first upgraded by Bogataj and Drobne (2005) and improved by Drobne in Bogataj, (2011), by adding the theory of taxation and deriving the influence of taxation on the coefficients in the model of Drobne and Bogataj (2011). The general form of the spatial interaction model used is:

$$S_{ij} = k K(c_{ij})^{\beta} \prod_r K(g)_i^{\gamma(g)} K(g)_j^{\alpha(g)}, \quad (1a)$$

regarding the significance of the coefficients in (1a), we have derived the following model

$$\begin{aligned} S_{ij} = & k K(c_{ij})^{\beta} K(POP)_i^{\gamma(POP)} K(POP)_j^{\alpha(POP)} K(RBO)_i^{\gamma(RBO)} K(RBO)_j^{\alpha(RBO)} \cdot \\ & \cdot K(BOD)_i^{\gamma(BOD)} K(BOD)_j^{\alpha(BOD)} K(V)_i^{\gamma(CST)} K(V)_j^{\alpha(CST)} \cdot \\ & \cdot K(POB)_i^{\gamma(POB)} K(POB)_j^{\alpha(POB)} K(STST)_i^{\gamma(STST)} K(STST)_j^{\alpha(STST)}. \end{aligned} \quad (1b)$$

In (1a) we denoted  $S_{ij}$  the yearly migration flow from the municipality  $i$  to the municipality  $j$ ,  $k$  is proportional constant,  $K(c)_{ij}$  is the coefficient of the time distance from the central business district (CBD) of the municipality  $i$  to the CBD of the municipality  $j$  relative to the average in Slovenia,  $K(g)_i$  and  $K(g)_j$  in the model (1a) are the coefficient of the studied indicators of  $g$  in origin  $i$  and destination  $j$ . This coefficients are derived as the value in the municipality divided by the average of Slovenia; the coefficients with the required significance are written in (1b) and described in the table 1. The powers (the regression coefficients  $\alpha$ ,  $\beta$  and  $\gamma$ ) of the linearised model present:

$\alpha(g)$ ----- the impact of the indicator in the destination

$\beta(g)$ ----- the power of the time distance;

$\gamma(g)$  -----the impact of the indicator in the origin.

The model (1b) was calibrated by Microsoft Excel 2016. The taxes have been calculated from the basic data in the database of the Register of the real estate of Slovenia and calculated by SPSS.

Table 1: The notation of  $g$  in the model (1b), the definition and the sources

| Notation | Definition                                                   | Source                   |
|----------|--------------------------------------------------------------|--------------------------|
| $c_{ij}$ | Time distance from CBD of $i$ to CBD of $j$                  | Drobne and Bogataj, 2017 |
| $POP$    | Number of inhabitants in the municipality                    | SORS                     |
| $RBO$    | The rate of unemployment in the municipality                 | SORS                     |
| $BOD$    | Gross income per capita in the municipality                  | SORS                     |
| $V$      | Urban land rent in the municipality in a given time distance | GURS                     |
| $POB$    | Municipality income per capita in the municipality           | MFRS                     |
| $STST$   | Number of dwellings in the municipality                      | SORS                     |

in the case that  $R$  is the yearly urban rent in a certain location,  $r$  is the interest rate, and  $u$  is the yearly tax on the basic value of the real estate  $V$ , than we can write (Janež, Bogataj in Drobne, 2016):

$$V = \frac{(R - u \cdot V)}{r} \rightarrow V \cdot r = R - u \cdot V \rightarrow V = \frac{R}{r + u}, \quad (2)$$

where  $r+u$  is the capitalisation rate (developed from the basic approach of McDonald in McMillen, 2011).

From (1b) and (2) the following equation has been derived for the attractiveness of the central place after the changed taxation ( $\tau_j \geq 0$ ) if the attractiveness up to the changes  $\tau_j < 0$  are known:

$$S_j(\tau_j \geq 0; POB, V) = \frac{S_j(\tau_j < 0; POB, V) \cdot (100 + v_j(POB))^{\alpha(POB)} \cdot 100^{\gamma(POB)}}{(p_j \cdot K(POB)_j \cdot \frac{v_j(POB)}{100} + 100)^{\alpha(POB) + \gamma(POB)}} \cdot \frac{(100 + v_j(V))^{\alpha(V)} \cdot 100^{\gamma(V)}}{\left\{ p_j \cdot K(V)_j \cdot \left( \frac{v_j(V)}{100} \right) + 100 \right\}^{\alpha(V) + \gamma(V)}} \quad (3)$$

Where  $p_j$  is the percentage of people who lives in  $j$ ,  $v_j(POB)$  is the percentage of the change of the indicator  $POB$  in  $j$ , while  $v_j(V)$  is the percentage of the change gross value of the indicator  $V$  in  $j$ , due to changed taxation.  $\tau$  present the time of observation,  $\tau_j < 0$ , and forecasting,  $\tau_j \geq 0$ . On the similar way we can develop the model for forecasting the expected flows from the origin  $i$ .



#### 4.3.4. The results

##### The results of the gravity model

The model (4) is a calibrated model of internal migration between the municipalities of Slovenia in the year 2015, in which we observed 44,944 migration interactions. The adjusted R<sup>2</sup> of the regression model is 37%. The p values of the coefficients in the model (4) are very low (significant at  $p < 0.0001$ ) and F statistics is very high ( $F=2.058$ ,  $p \approx 0$ ):

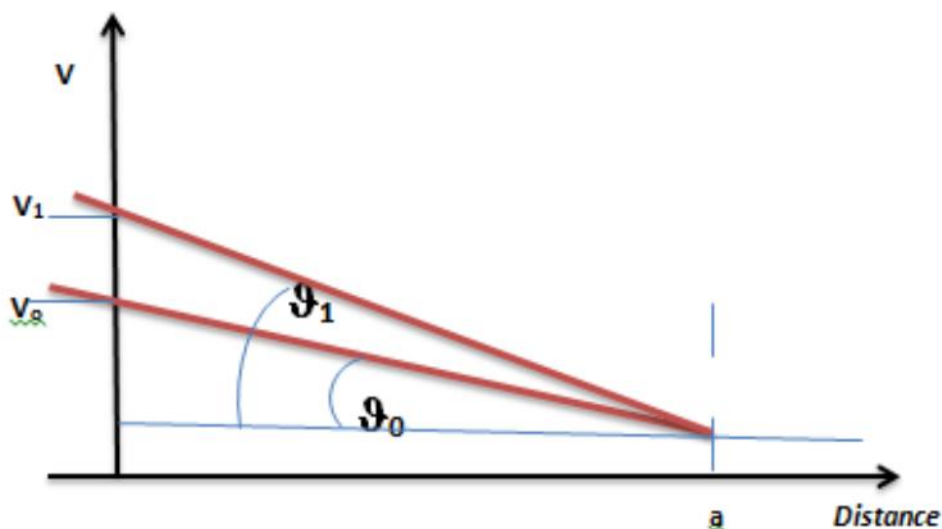
$$S_{ij} = 0,007 K(c_{ij})^{-2,619} K(POP)_i^{0,794} K(POP)_j^{0,723} K(RBO)_i^{0,569} K(RBO)_j^{0,625} \cdot K(BOD)_i^{0,774} K(BOD)_j^{1,063} K(V)_i^{0,321} K(V)_j^{0,429} \cdot K(POB)_i^{0,624} K(POB)_j^{0,731} K(STST)_i^{-0,249} K(STST)_j^{-0,249}. \quad (4)$$

##### The impact of the changed taxation on the bid rent curve of a chosen municipality

Let us now turn our attention back to the bid rent curve. The impact of taxation on the bid rent was explained in Bogataj and Bogataj (1995) and drawn in Bogataj (2000), as given in Figure 3.

We see that a household will tend to move to another location if the change of his rent curve slope is higher or lower from the neighbor's activity or housing slope. If the taxes will increase the gross value by 10%, the household whose slope is now like  $\tan \varphi_0 = 0.5$  will increase to  $\tan \varphi_1 = 0.55$ .

At the same time, the changed taxation will move the activities line up or down if the attractiveness is increasing or decreasing respectively.



$$V_1 = V_0(1 + v_j / 100)$$

The slopes:  $V_1/a = \tan \varphi_1$ ;  $V_0/a = \tan \varphi_0$

Figure 3: The change of slope of the gross urban land rent depending on the distance from the CBD in case of changing taxation so that the gross value is equal to the previous value  $V_0$  multiplied by  $(1 + v_j / 100)$ , which means that it increases relatively for  $v_j / 100$

Let us assume that in our considered municipality M, where yearly migration is equal to 1000 new residents and where is leaving  $p_M = 0.7\%$  of all inhabitants of Slovenia, the coefficients of the indicators which influence the attractiveness of the municipality are the following:

Table 3: The indicators of the municipality M

|                   |                   |     |
|-------------------|-------------------|-----|
| $K(c_{ij}) = 1,1$ | $K(V_o)=1,3$      | (5) |
| $K(POP_o) = 1,5$  | $K(POB_o) = 0.8$  |     |
| $K(RBO_o)=0,8$    | $K(STST_o) = 1,3$ |     |
| $K(BOD_o) = 1,2$  |                   |     |

We assume that the municipality intends to raise the yearly rent tax from 7% to 14% which would increase the municipality's real estate taxes for 6.5% regarding the average in the state and the municipality income per capita for 5%. How will it influence the attractiveness of municipality indicated in the number of newcomers? Following the equation three at a given value in (4) and (5) we can write:

$$S_M(\tau_M \geq 0) = \frac{S_M(\tau_M < 0) \cdot (100 + 5)^{0.731} \cdot 100^{0.624}}{(0.7 \cdot 0.8 \cdot 5 + 100)^{0.731+0.624}} \cdot \frac{(100 + 6.5)^{0.321} \cdot 100^{0.429}}{\{0.7 \cdot 1.3 \cdot 6.5 + 100\}^{0.321+0.429}} =$$

$$= S_M(\tau_M < 0) \cdot 0.9982 \cdot 0.9774 = S_M(\tau_M < 0) \cdot 0.9757$$

It means that an increase of taxation and revenues for investments in the municipal infrastructure and services, when the other municipalities do not change the taxation, would decrease the migration flow for 2.4% (=1-0.9757). By adding the impact of the outflow which can be derived from equation 1b by summation over j on the same way as for (3), we can see, what are the changes of the monopoly urban land rent which moves the equilibrium bid rent curve up or down.

To determine the bid rent curve we have to consider also the stochastic behaviour of this curve, as presented by Martínez and Henríquez (2003), often being influenced by many subjective factors, therefore sometimes also fuzzy approach to the evaluation of parameters is suggested, like presented by Bogataj, Tuljak-Suban, and Drobne (2011), where the fuzzy set theory was also facilitated.

#### 4.3.5. Conclusion and guidelines for further work

To embark on the path of smart, sustainable and inclusive growth, to develop age-friendly urban environment and invest in the infrastructure and supply networks that will transform European cities to smart cities, creating jobs, wellbeing for older inhabitants who need a help of others, and enhancing competitiveness, Europe faces large-scale, long-term investment needs, where housing and infrastructure investments represent a major part of the gross fixed capital formation, but influence also attractiveness and stickiness of municipalities, which can be studied on the bases of gravity models. To support required policies and for evaluation of potential investments, the general theory of land rent as a regulator of urban growth should be reconsidered. Recent experience in several European countries has clearly and painfully shown that the housing market volatility has a substantial impact on financial flows, supply chains and migration in the society, on a wealth of households, and national and international financial systems as collateral for mortgage financing. This volatility influences the investments in the development, maintenance, and redevelopment of urban areas, in public utilities, transport, and ICT infrastructure, and makes institutional investors reluctant to invest in city infrastructures due to the low predictability of long-term cash flows, needed for asset liability matching.

Housing expenditure constitutes nearly one-third of the household's income, and housing wealth makes more than a half of the median household's net worth in Europe. The macro implications of housing dynamics are significant, following one of the largest residential real estate boom-and-busts and the subsequent recession which additionally disclosed the specific problems of the aging European societies and their dependence on the stable housing market. Therefore the crucial question in today's European economy is: "How to leverage the European wealth and facilitate the flows to achieve well-being for all generations (job opportunities for the young and proper care for seniors)"? The answer is in the development of a firm understanding of the

interaction between the attractiveness of a municipality in the set of competitive local areas. The theory can be developed based on the gravity approaches. It helps to improve further a general theory of land rent in the post-industrial age, where the attractiveness depends on the age structure of inhabitants, and therefore also the bid rent curve is dependent on the age structure. Based on the models outlined here and even extended to the gravity models of daily commuting and on the interaction of them like presented here, the decision support systems could be provided to the municipalities, institutional investors and other stakeholders, providing them with a better, transparent information and first-quality risk management tools that will enable the allocation of capital of institutional investors to housing and infrastructural projects in the best possible way and enable a better protection and return to the investors.

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#### 4.4. Real Estate Monitor for Office and Industrial space in the City of Groningen 2018

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In this hectic time for the real estate world, there is a need for information. Information about important market elements, such as stock, supply, take-up and vacancy rate for all market segments within the property market as a whole. A correct strategy for the future can only be developed on the basis of a thorough substantiation. With the Groningen Real Estate Monitor, which we have published on behalf of the Municipality of Groningen for the past 3 years, we expect to contribute to market knowledge about the office and industrial market.

Unlike other reports and surveys, our figures do not come from information lists, assumptions and telephone surveys; our database is based on the BAG data (Basic Registration of Addresses and Buildings).

Every year, we compare the stock, supply, vacancy rate, take-up, transformations and new development with the figures from the year before. In order to provide as complete a picture of the developments as possible, 1,750 office and industrial buildings are visited every year, representing approximately 88% of the total floor space. The users of the various office and industrial spaces are also described, so that the take-up can also be determined.

Changes are made visible on the basis of the tours and actual visits to the buildings, identifying companies that have moved, new vacancies, new FOR RENT signs (or signs that have disappeared) etc. Obviously, afterwards, there will be another double-check of the figures by means of interviews with real estate agents, owners and users of office and industrial spaces. All in all very time-intensive, but in this way, we try to paint as complete and accurate a picture of the market as possible.

##### 4.4.1. The office market in Groningen

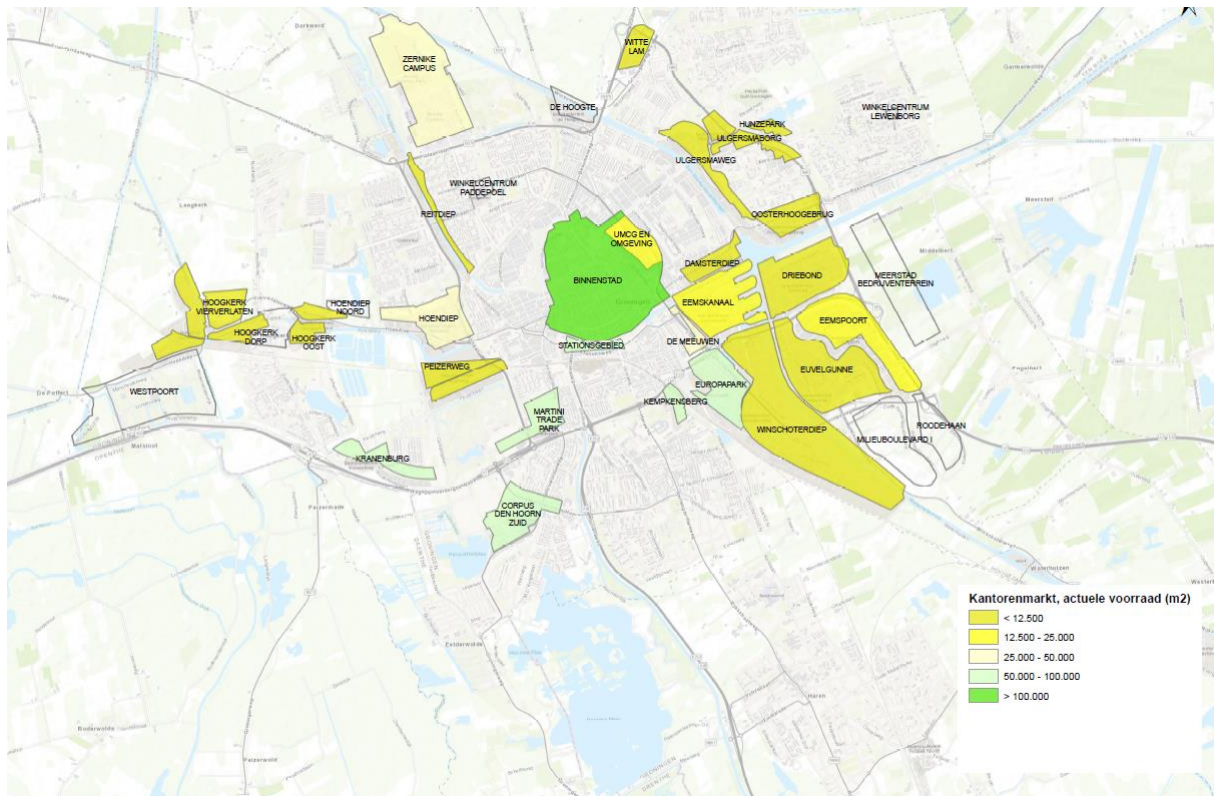
After a few difficult years, the office market has been showing positive developments over the past three years. A better balance has been achieved between the demand for office space on the one hand and the available supply and stock on the other hand. This is largely because a considerable number of square meters of office space have been removed (transformed, demolished) from the market, but also because of a higher (effective) take-up.

Older office buildings in particular lend themselves for being transformed into housing. There have barely been any new developments in recent years. At the beginning of 2018, the total office stock was approx. 1,100,000 sq.m.

The significant growth in the take-up of office space in 2016 and 2017 ensured a better quantitative ratio between supply and demand. The take-up rose from 19,000 sq.m in 2015 to almost 31,000 sq.m in 2016, and no less than 48,500 sq.m in 2017. This was the highest take-up since 2009.

The take-up, in addition to the transformation of office buildings, resulted in a lower vacancy rate. At the end of 2017, the vacancy rate amounted to 114,000 sq.m, representing approx. 10.1% of the total stock; a year earlier, this was still 11.2% (and 13% at the end of 2015).

The vacancy rates at work locations with the most vacancies range from 13.5% in Kranenburg to 54.8% in the smaller work location of Eemskanaal. There are hardly any vacancies at the work locations Binnenstad [city centre] and Stationsgebied [Station area] (3.3% and 1.3% respectively).



Perhaps more important than the vacancy rate is the supply of office space. The total supply has gone down nation-wide; this is also seen in Groningen. On 1 January 2018, the available supply of office space was approx. 105,000 sq.m; down about 17,000 q.m compared to a year earlier.

The available space is mainly situated in the sub-areas of Corpus den Hoorn, Martini Trade Park, Kranenburg, Europapark and Eemskanaal. In all these areas, 10,000 sq.m to 20,000 sq.m of office space is available. It is noteworthy that the five largest buildings available account for no less than 36% of the total supply.

A further analysis of the availability shows a shortage of young office buildings. Most of the buildings available are older than 20 years. The supply in attractive and multifunctional areas, such as the Binnestad and the Stationsgebied is also very limited. In these areas, three buildings with more than 500 sq.m were available on 1 January 2018.

It is noteworthy that not all vacant buildings are available; some of the vacant office space is not for rent or for sale. In total, this floor space amounted to approximately 43,000 sq.m. This situation can partly be explained by the fact that redevelopment is envisaged for these locations, buildings are being renovated or converted, or that redevelopment or re-letting is being planned. As a result, these spaces are visible in the vacancy figures, but not in the supply figures. These developments and transactions will result in a decrease in the vacancy figures in the future.

Some office buildings that are still in use, are being offered for rent or for sale, and are therefore included in the supply figures. For these buildings, the expectation is that vacancies will arise in time/in the short term. Approximately 27,000 sq.m of the total available floor space is not yet included in the vacancy list. It can be concluded that for this available floor space, there is a risk that the current users will move or reduce in numbers.

With a view to making office buildings more sustainable and the obligation imposed by the government for owners of office buildings (over 100 sq.m) to meet at least a Grade C Energy Performance Certificate (EPC) from 2023 onwards, in the past year, we also looked at the presence of these EPCs and their rating.



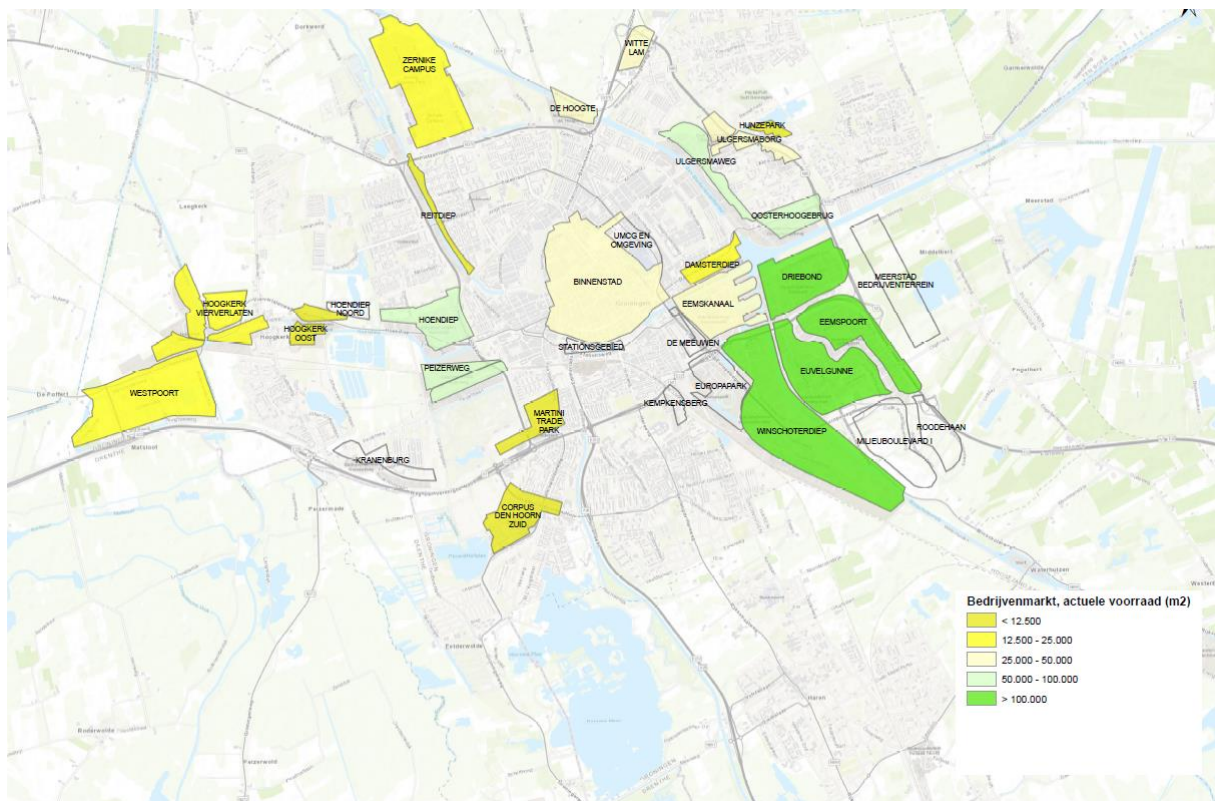
Of the office buildings (1,113 buildings in total), only 338 buildings (30%) had an energy label. Of these, 73 buildings had a provisional energy label. This means that only 23.5% of the office buildings have a definitive energy label. 143 buildings (12.5%) have a Grade C energy label or better (131 definitive and 12 provisional). In the coming years, therefore, the market will be faced with the considerable challenge to invest in existing buildings in order to meet this requirement.

#### 4.4.2. The industrial market in Groningen

Industrial spaces are understood to mean all spaces which are mainly intended for activities in construction, transport/logistics and wholesale, in light and heavy industry and workshops. Mixed office/industrial spaces are also included in the registration.

On 1 January 2018, the total stock of industrial space comprised approx. 1,480,000 sq.m. The distribution of the industrial stock over the various work locations is shown in the figure below. This stock is made up of approx. 1,260,000 sq.m of industrial space (excl. offices and excl. grounds) and 220,000 sq.m of industrial offices.

Industrial offices are offices that are part of a industrial building. Independent office buildings on industrial estates are included in the office stock (see Chapter 3). The office stock lists solitary office buildings or buildings with a dominant office function. This avoids double counting.



The figure above shows that the largest concentration of space can be found at the work locations “Winschoterdiep”, “Euvelgunne”, “Driebond” and “Eemspoort”. More than 50% of the entire industrial stock is found here. The stock has remained fairly stable during the year 2017. Approx. 15,000 sq.m was removed from the market in 2017, but on the other hand, a new development was realised for ColliCare Logistics at Westpoort, and there are still many developments under construction, at Eemspoort in particular.



In 2017, the take-up of industrial spaces also resulted in a reduction in the vacancy rate and a lower supply in Groningen. The take-up was approx. 61,000 sq.m, which was above the 2015 and 2016 levels (both approx. 50,000 sq.m). The sub-areas “Driebond”, “Eemspoort”, “Euvelgunne” and “Winschoterdiep” benefited most from this take-up; they accounted for 75% of the total take-up. The take-up in 2016 also mainly took place in these sub-areas. The 10 largest transactions represented more than half of the take-up. However, most of the transactions related to industrial space (or associated office space) of less than 500 sq.m.

The vacancy for industrial space fell from 137,016 sq.m on 1 January 2017 to 104,000 sq.m on 1 January 2018, representing 7% of the stock. The vacancy for the year 2017 for office space being a part of industrial space amounted to 48,000 sq.m. This means that almost half of all vacancies consist of office space. This is comparable with the figures for 2016. The vacancy rates are above average in the sub-areas “Oosterhoogebrug” (30.0%) and “Peizerweg” (15.2%). However, in both cases, this can largely be explained by only one or two larger vacant buildings, in relatively small sub-areas. On the other hand, it is noteworthy that there are surprisingly few vacancies in the larger sub-areas “Driebond” (3.4%) and “Eemspoort” (2.9%).

The vacancy in the market is mainly concentrated in a number of large buildings. The largest vacant building on 1 January 2018 was located at the Peizerweg (formerly Alfa Laval), followed by a building at the Koningsweg (formerly Raab Kärcher). These two buildings each have a floor area of more than 10,000 sq.m. The four largest vacant buildings in the market together account for more than 37,000 sq.m of vacant space, as much as 36% of the vacancy in the industrial market.

At the beginning of 2017, the supply of industrial space was still around 55,000 sq.m. During the year 2017, this decreased to 43,000 sq.m. A total of approx. 21,000 sq.m of office space available for rent or sale is included in these industrial spaces. The supply is mainly found in the four largest sub-areas, with “Winschoterdiep” accounting for approx. 40%. About 40% of the total supply in the market is located in four buildings. The majority of available spaces is smaller than 1,000 sq.m.

Approx. 85,000 sq.m in vacant industrial buildings are not yet available. These may be put on the market, but it is possible that for a part of these vacancies redevelopment plans are in the pipeline. About 20,000 sq.m of the available floor space is not yet vacant. It is possible that these will become vacant in the near future. However, the number of square meters available is relatively low and is spread over 35 buildings, which limits the risk of vacant large buildings.

#### **4.4.3. Conclusions**

##### **Office space in Groningen**

After a few difficult years in the national office market, the years 2015, 2016 and 2017 are showing a positive development. In 2015, for the first time in years, we are seeing a reduction in the vacancy rate. In addition, looking at the take-up figures, the demand for office space is growing.

A major factor in the reduction of the vacancy rate is the transformation of vacant office buildings. In Groningen, approx. 42,000 sq.m of vacant space has been redeveloped in the past 3 years, and has mainly been transformed into housing (student accommodation).

The largest part of the currently available stock that is also offered for rent or sale is located at office locations such as Corpus den Hoorn, Martini Trade Park, Kranenburg and Europapark. There is an explicit scarcity of available space in the Binnenstad and Stationgebied, while there is still a demand for office space at these locations. We foresee an upward price pressure for these locations and the limited availability here will result in an overflow of office users to sub-locations. As soon as the characteristics of these sub-locations do not match the wishes of the office user, though, there is a risk that companies will settle on a location outside the city of Groningen. However, in view of the shift from larger companies to smaller and more local companies (freelancers, start-ups), this risk is reduced as these companies feel more connected with the city of Groningen.

In addition to the shortage at the said locations, there is a scarcity of (availability of) young buildings. In addition, there is a very limited availability of smaller solitary office buildings (between 250 sq.m and 750

sq.m). Further research into the needs of office users could throw more light on the extent to which this scarcity can have a negative impact. At first glance, the current demand seems to be answered by multi-tenant buildings, buildings with multiple users.

Redevelopment or lease up of one or more relatively large office buildings (for example Leonard Springerlaan 35, Henri Dunantlaan 2, Europaweg 8 and/or Eendrachtsskade zuidzijde 2) can result in a completely different picture of the size of the availability and the vacancy rate.

It is advisable to continue paying attention to vacancies at the work locations Martini Trade Park, Kranenburg and Corpus den Hoorn Zuid. The vacancy rates here are above average. Initiatives for transformation at Corpus den Hoorn Zuid can result in a better ratio between supply and demand or stock.

### **Industrial space in Groningen**

The economic growth, resulting in the (net) expansion of businesses, the entry of new businesses, less vacancy and less supply, creates shortage in the industrial market in Groningen.

On the one hand, the current supply does not always match the needs of users, even after possible renovations. For example, the ratio office space to industrial space is often not optimal, which means that companies have to rent too much office space. This is partly due to the fact that many of these mixed industrial/office buildings were built in a period where the number of office meters per employee was higher than the current standards.

In addition, the total available square meters are limited. On 1 January 2018, only 22,000 sq.m of industrial space was available (excl. the accompanying office space), primarily in smaller units.

Given the developments in the first months of this year, we expect a further decline in vacancy and supply. As a result, the existing stock offers less possibilities for expansion of existing companies or the entry of new companies. New development seems to be the only option for companies to stay within the city of Groningen. We are already seeing various initiatives to this end and it is expected that in 2018, several new developments will be completed and these square meters can be added to the stock.

### **4.4.4. Glossary**

*Below is a brief explanation of terms used, to substantiate the various market elements in the report.*

#### **Office**

An office is understood to mean a spatially independent unit, largely in use for desk-related or supporting activities. Office spaces that are part of industrial buildings (industrial spaces), care homes, schools or hospitals are, in principle, not considered to be offices (definition NVM).

#### **Industrial spaces**

Industrial spaces are understood to mean all spaces which are mainly intended for work in construction, transport/logistics and wholesale, light and heavy industry and workshops. Mixed office/industrial spaces are also included in the registration. The report then clearly distinguishes between the actual industrial spaces (business, production, warehousing) and office space. Bulk or peripheral retail trade (contrary to the definition of the NVM) is not considered to be industrial space and therefore falls outside the registration.

#### **Take-up and supply**

Take-up is understood to mean the rental and sales transactions that take place on the free market. New development for owner-occupiers (the so-called owner-occupier development) - as well as sale-and-lease-back transactions and contract extensions or renewals - are not taken into account. The take-up level was established on the basis of data provided by the municipality of Groningen and subsequently tested on the basis of figures from Cushman & Wakefield, NVM, Dynamis and the local real estate agents and interviews with property owners and users. Cushman & Wakefield, Dynamis and the NVM however, register transactions with a different minimum size, allowing for differences in the final outcomes.

The supply consists of the office and industrial spaces available for rent or sale. Offices and industrial spaces that are still under preparation are not included. The supply therefore only relates to objects already delivered or still under construction.

The total supply resulting from the WOZ data has been tested and corrected by means of the various visits to buildings and the information obtained from websites such as fundainbusiness.nl, realnext.nl and websites of local (business) real estate agents. It should be noted here that the available surface area of office space on the various Internet sites is usually given in “v.v.o.” [rentable floor space], in contrast to the “b.v.o.” [available floor space] used in the vacancy figures and figures for the total stock.

### **Stock**

The total office and industrial stock consists of the total of existing office and industrial spaces. Office and industrial spaces under construction are not included in the stock. In contrast to many other reports, this report includes all square meters floor space based on the WOZ data (a combination of b.v.o. and v.v.o.) of the Municipality of Groningen, and not just those with an surface area of 500 sq.m v.v.o. or more.

### **Vacancy rate**

The vacancy rate concerns the office and industrial spaces in completed buildings and which are not or no longer in use on the reference date of this report. The vacancy rate is based on the WOZ data from the Municipality of Groningen and is expressed in this report as a total number of sq.m b.v.o., and also as a percentage of the total office stock.

## 5. Digitalization and Real Estate

### 5.1. Get a Brick

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Get a Brick is een startup die beleggen in duurzaam en kwalitatief vastgoed toegankelijk wil maken voor het grote publiek; huishoudens zonder een bovengemiddeld vermogen of verstand van vastgoed. Door de lage rentes op bijvoorbeeld spaarrekeningen, deposito's en Nederlandse staatsleningen zoeken deze huishoudens naar alternatieve mogelijkheden om hun vermogen te laten groeien (De Nederlandsche Bank, 2016) (CBS, 2018) (ECB, 2018). Get a Brick wil deze huishoudens naast een financieel rendement ook de mogelijkheid geven om een maatschappelijk rendement te ontvangen. Dit kan gerealiseerd worden door de huishoudens te betrekken als beleggers en gezamenlijk te investeren in hun bebouwde omgeving. Get a Brick wil in hun bedrijfsvoering en in hun visie op de bebouwde omgeving innovatie en duurzaamheid een belangrijke rol laten spelen (Brickstarters, 2017).

Get a Brick wil alle beleggers bij elkaar brengen middels een onlineplatform waarop panden geëtaleerd worden. De beleggers kunnen vervolgens participeren in de beleggingen om financieel rendement te behalen. Het platform staat symbool voor innovatie in de vastgoedwereld, een wereld waarin veel ruimte is voor verbetering en betrokkenheid van het publiek. Het platform zal de beleggingsobjecten visualiseren en de beleggingspotentie inzichtelijk weergeven. Het platform zorgt niet alleen voor een duidelijke weergave van beleggingsobjecten en de potentie daarvan, maar is tevens een tastbaar platform dat mensen een gevoel kan geven van een participerende samenleving en de mogelijkheden die daardoor worden gecreëerd (Brickstarters, 2017).

De beleggersdoelgroep is een belangrijk aspect in het nieuwe vastgoedbeleggingsconcept van Get a Brick. Zonder de beleggers is het niet mogelijk om panden te kunnen aankopen en daarmee zijn ze essentieel voor de continuering van het vastgoedbeleggingsconcept. De beleggersdoelgroep is niet een standaard doelgroep van beleggers en daarom moet er goed gekeken worden wat de kenmerken zijn van de beleggers en wat zij echt belangrijk vinden indien zij beleggen in het algemeen of specifiek in vastgoed. Get a Brick heeft op dit moment nog geen portefeuillestrategie die inspeelt op de kenmerken van de beleggers. Daarnaast heeft de organisatie zelf ook wensen en eisen omtrent het vastgoedbeleggingsconcept waarvan zij liever niet van willen afwijken. Het probleem van Get a Brick is om die reden dat zij nog geen beschikking hebben over een portefeuillestrategie waarin de beleggers centraal staan en waarin de wensen en eisen vanuit Get a Brick gewaarborgd kunnen worden. Volgens Get a Brick omvat een portefeuillestrategie de financiële en maatschappelijke wensen en eisen vanuit de beleggers en de organisatie op het gebied van beleggen, vastgoed en de bebouwde omgeving (Brickstarters, 2017).

Om te achterhalen wat de financiële en maatschappelijke eisen zijn vanuit de beleggersdoelgroep is er een kwalitatief onderzoek gedaan. Er zijn tien respondenten uitgekozen aan de hand van hun gender, leeftijd, maatschappelijke oriëntatie en levensfase om daaropvolgend een interview af te nemen. Dit interview heeft als doel gehad om hun financiële en maatschappelijke wensen en eisen met betrekking tot beleggingen en de bebouwde omgeving te achterhalen. De resultaten van dit onderzoek zijn gecodeerd en verwerkt tot specifieke wensen en eisen die worden meegenomen in de portefeuillestrategie. Daaropvolgend zijn de financiële en maatschappelijke wensen en eisen vanuit Get a Brick opgesteld om een totaalbeeld te krijgen en een vergelijking te maken met de wensen en eisen vanuit de beleggers. Aan de hand van vier aspecten in een vastgoedportefeuille volgens Get a Brick: beleggingswijze, type vastgoed, financieel en maatschappelijk, is gekeken hoe deze onderdelen ingevuld kunnen worden om te voldoen aan de financiële en maatschappelijke eisen en wensen vanuit de beleggers en Get a Brick (Brickstarters, 2018).

De beleggingswijze zal middels obligaties worden gedaan waarin wordt gestuurd op een vaste rente en waarin het pand als onderpand zal gelden. Hiervoor is gekozen omdat de beleggers graag minimaal risico willen lopen en daarvoor lagere rendementen accepteren. Daarnaast is het mogelijk om middels obligaties een lage instap voor de beleggers te creëren en daarmee de toegankelijkheid voor het beleggingsproduct vergroten. Vanuit

Get a Brick ligt de voorkeur bij obligaties omdat zij anders moeten voldoen aan hogere eisen die worden gesteld vanuit de AFM. Bij obligaties geldt namelijk geen vergunningsplicht en in de meeste gevallen alleen een prospectusplicht (AFM, 2018). De obligaties kunnen voor 5 of 10 jaar worden aangegaan tegen een rente van 3% voor jaar en 4% voor 10 jaar en zijn tussentijds niet verhandelbaar. De intrinsieke waarde is gekoppeld aan de taxatiewaarde van het pand en daarmee kan een belegger ook winst of verlies maken op zijn inleg. De fluctuering van de inleg van de beleggers heeft niet hun voorkeur maar kan niet anders dan met een onderpand deels worden gegarandeerd door Get a Brick (Brickstarters, 2018).

Het type vastgoed komt vanuit marktonderzoek neer op residentieel, commercieel en zorgvastgoed. Specifiek zal de voorkeur liggen bij microappartementen, healthy offices, shared all-in werkruimtes en ouderen/zorgwoningen. De respondenten hebben aangegeven duurzaam, uniek en lokaal vastgoed te prefereren. Deze kenmerken passen erg goed bij de visie van Get a Brick vanuit het marktonderzoek en is daarmee geschikt voor de portefeuillestrategie. Met zicht op diversificatie om daarmee het specifieke risico te reduceren is de diversiteit van de vastgoedfuncties gunstig en zal tevens worden gestuurd op geografische spreiding. De geografische spreiding zorgt niet alleen voor risicoreductie maar zorgt ook nog voor meer kansen op participatie in lokale objecten voor de beleggers die zelf ook verspreid zijn door Nederland (Brickstarters, 2018).

Vanuit de CAPM en de WACC zijn rendementseisen geformuleerd vanuit Get a Brick. Deze rendementseisen zijn indicatie voor het minimaal te behalen rendement op de portefeuille om zodoende de bedrijfskosten en financieringslasten van Get a Brick te dekken. Daarnaast moet er nog voldoende winst overblijven om het continueren van vastgoedbeleggingsconcept rendabel te behouden. Dit komt doordat Get a Brick een effort-based verdienmodel hanteert en daarmee met goed vastgoedmanagement het verschil moeten maken. Vanuit de CAPM en de WACC kan de rendementseis worden vastgesteld op 5.4% waarin tevens een LTV geldt van 60% voor hypotheckair krediet (Brickstarters, 2018).

Het maatschappelijke aspect voor de beleggers is erg belangrijk. Zij willen dat Get a Brick een transparante en betrouwbare organisatie wordt die een goede trackrecord gaat opbouwen. Zij willen graag betrokken zijn bij de beleggingen door middel van informatieverstrekking en eventuele participatie in de beslisvorming bij panden. Om dit haalbaar te maken voor Get a Brick wordt er gebruikt gemaakt van digitale kanalen om snel iedereen te kunnen bereiken en participatie middels stemrecht mogelijk te maken. Vanuit de respondenten is gebleken dat deze manier voor communicatie ook hun voorkeur heeft. Get a Brick moet volgens de beleggers dus een duurzame en innovatieve vastgoedbelegger worden die hun beleggers de mogelijkheid geeft om te beleggen in vastgoed en te investeren in hun bebouwde omgeving (Brickstarters, 2018).

### **5.1.1. Mogelijkheden Blockchain?**

Bovenstaand onderzoek was gericht op het vastgoedbeleggingsconcept zoals die in beginsel is neergezet door de organisatie van Get a Brick. Daaropvolgend is er een algemeen verkennend onderzoek geweest die globaal de potentie van Blockchain binnen het vastgoedbeleggingsconcept heeft weergegeven. Dit onderzoek beperkt zich tot een globale potentie van Blockchain. Ten behoeve van het boek 'Blockchain Technology and Applications' die wordt uitgegeven door Nova science publishers met dr. Jan Veuger FRICS als editor zal hier een vervolgonderzoek op komen.

### **Geldtransacties**

Peer to peer betalingen zijn een voortvloeisel uit het gedecentraliseerde netwerk en het gebrek aan tussenkomst van derden. Deze betalingen zijn effectief, goedkoop, snel en kan door beleggers onderling worden uitgevoerd (Tapscott, 2016). Op deze wijze kunnen de beleggers makkelijk participaties in objecten verwerven en daaropvolgend onderling verhandelen. De transacties kunnen worden gevalideerd worden door het netwerk (nodes) en aan de hand van de smart contracts kunnen de voorwaarden vanuit Get a Brick worden vastgesteld (advocaten, 2018). Dit kan met traditionele valuta gebeuren, maar er zou ook gekozen kunnen worden voor cryptovaluta (Vigna & Casey, 2016).

In dit geval zou Get a Brick ervoor moeten kiezen om de waarde van een coin te vestigen middels een ICO (Krull-Mancinelli, 2017). De nominale waarde van de coin zou dan worden gekoppeld aan de aankoop prijs van een pand en de intrinsieke waarde van de coin zou daaropvolgend fluctueren aan de hand van de

taxatiewaarde van het pand. In het geval van een open fonds waarin niet in één pand wordt belegd maar in de gehele portefeuille dan zou de nominale waarde zijn gekoppeld aan de gehele portefeuille en de intrinsieke waarde zou meebewegen op de waarde van de gehele portefeuille.

### **Vastleggen van eigenaarschap**

De Blockchain maakt het mogelijk om de het eigenaarschap van de beleggers in de objecten makkelijker vast te leggen (Tapscott, 2016). Dit maakt het voor Get a Brick makkelijker, sneller en goedkoper om vreemd vermogen aan te trekken en het eigenaarschap van het object te verdelen over grote aantallen beleggers. Daaropvolgend kan geconcludeerd worden dat dit tevens de mogelijkheid kan bieden om de participaties in het object qua minimale inleg te minimaliseren. Dit vergroot de toegankelijkheid voor de 'normale' Nederlander zonder bovengemiddeld vermogen om te beleggen in de objecten van Get a Brick.

### **Betrouwbaarheid**

Get a Brick hecht veel waarde aan haar uitstraling richting de maatschappij. Daarnaast is gebleken uit het onderzoek naar een juiste portefeuillestrategie voor Get a Brick dat de beleggersdoelgroep hier veel waarde aan hecht op basis van risicoavers gedrag jegens beleggingen, maar ook naar de organisaties (Brickstarters, 2018). Betrouwbaarheid die gewaarborgd kan worden bij de transacties tussen beleggers onderling en tussen beleggers en Get a Brick middels nodes is om die reden van toegevoegde waarde (Tapscott, 2016).

### **Transparantie en veiligheid**

Transparantie is een belangrijk punt van Get a Brick en het decentrale karakter van Blockchain maakt het mogelijk om dezelfde informatie te verstrekken onder alle gebruikers van de Blockchain (Tapscott, 2016). Doordat de beleggers van Get a Brick toegang hebben tot het dataregister waarin de transacties worden vastgelegd, biedt dit inzicht in de transactieprocessen. Daarnaast zorgt de noodzaak tot validatie van een transactie door het netwerk ook dat het een veilig karakter heeft. Daarnaast is het niet mogelijk om informatie te wijzigen of te verwijderen (Vermeend & Smit, 2017). Al deze aspecten wegen mee in het optimaliseren van de transparantie en veiligheid.

### **Alleen transacties?**

Naast geldtransacties voor de beleggers zou Get a Brick nog veel meer dingen kunnen verwerken in de Blockchain (Tapscott, 2016) (Krull-Mancinelli, 2017). Hierbij kan gedacht worden aan de koopovereenkomsten, huurcontracten, meerderjarige onderhoudsplanningen en ook de huurinkomsten. In principe zouden alle procedurele activiteiten middels de Blockchain geregeld en geautomatiseerd kunnen worden. In een ultiem scenario zouden andere organisaties ook gebruik maken van Blockchain. Denk hierbij aan een gemeente die middels Blockchain de onroerendezaakbelasting kan innen of de energieleverancier die de data omtrent energieverbruik kan registreren en tevens de geldtransacties kan laten verlopen via de Blockchain.

Ook binnen het vastgoedmanagement zou Get a Brick zelf daarin een groot gedeelte zelf in voldoen. Denk hieraan bijvoorbeeld aan het reguleren van de temperaturen, lichten en andere installaties. Indien andere organisaties zoals de aannemer ook gebruik zou maken van Blockchain zou de Blockchain zelf aan de hand van de MJOP ook opdrachten kunnen verzenden naar de aannemer voor bijvoorbeeld preventief onderhoud op specifieke elementen in het gebouw (Leeuw, 2018).

### **Geen tussenkomst van derden**

Geen tussenkomst van derden is een resultaat van de geautomatiseerde processen en smart contracts (Tapscott, 2016) (advocaten, 2018). De smart contracts kunnen de vooraf opgestelde voorwaarden die zijn verbonden aan de participatie in een object vastleggen en daaropvolgend leidend zijn bij transacties van geld of bijvoorbeeld eigendomsaktes. Dit zorgt ervoor dat er geen validatie meer hoeft te komen voor de geldtransacties middels de bank en geen tussenkomst van een notaris voor bijvoorbeeld de eigendomsakte (Krull-Mancinelli, 2017). Daarentegen moet de informatie omtrent een object wel beschikbaar zijn in de Blockchain. Dit zou niet werken als het Kadaster niet is aangesloten op de Blockchain of de betreffende informatie niet op een andere wijze beschikbaar is.



## Energie

Duurzaamheid is een belangrijk element in het vastgoedbeleggingsconcept, een dusdanig belangrijk element dat er niet van afgeweken zou kunnen worden (Brickstarters, 2018). Blockchain een systeem dat veel energie vereist om operationeel te kunnen blijven (Tapscott, 2016). Het zou voor Get a Brick daarmee een slecht imago creëren om daarin op in te spelen. De Blockchain kan daarentegen ook zorgen voor veel energiebesparing door alle toepassingen die het kan bevatten. Er zal ergens sprake zijn van een break-even punt tussen energieverbruik en energiebesparing op basis van het gebruik van de Blockchain door Get a Brick als organisatie.

## Privacy

De transparantie die vanuit de Blockchain wordt geboden en vanuit de beleggersdoelgroep van Get a Brick wordt geëist is een goede combinatie (Brickstarters, 2018). Desalniettemin is het gehele netwerk transparant en dat zou dan weer inbreuk maken op de privacy van de beleggers. (Tapscott, 2016) Omdat er wel gekozen kan worden voor pseudoniemen en anonieme identiteiten is dat te verhelpen (Leeuw, 2018). Daarentegen is daarmee de transparantie ook weer in het geding. Het gebrek aan transparantie vanuit andere beleggers is daarentegen van ondergeschikt belang en zeker als het grote aantallen betreft. De transparantie vanuit Get a Brick als organisatie is veel belangrijker en die kan te allen tijde worden gewaarborgd middels de Blockchain. Het is hierin dus meer van belang dat de privacy van de beleggers wordt gewaarborgd en de transparantie vanuit Get a Brick als organisatie.

### 5.1.2. Concluderend

De potentie van het snel, effectief en goedkoop aantrekken van vreemd vermogen is specifiek voor het vastgoedbeleggingsconcept van Get a Brick aantrekkelijk. Daaropvolgend is het makkelijk registreren van het eigenaarschap ook een groot voordeel omdat hiermee de minimale inleg voor een participatie kan worden verlaagd en daarmee de toegankelijkheid worden vergroot. De betrouwbaarheid, veiligheid en transparantie van Blockchain komt ook goed overeen met de eisen vanuit de beleggersdoelgroep en de organisatie van Get a Brick. Daarnaast wil Get a Brick ook een innovatief karakter nastreven en daarom ook inspelen op kansen die het vastgoedbeleggingsconcept kunnen ondersteunen en versterken. Tot slot zou de organisatie van Get a Brick relatief klein kunnen blijven en toch hun portefeuille verder uitbreiden doordat vele processen effectiever, sneller en geautomatiseerd kunnen verlopen. Dit zou als resultaat kunnen hebben dat marktrendementen in de benchmark verslagen kunnen worden door de implementatie van Blockchain in de processen van Get a Brick. Zodoende zou er een vorm van een Jensen's alpha ontstaan indien Blockchain op de meeste optimale wijze wordt geïmplementeerd en er hogere rendementen worden behaald dan de op voorhand vastgestelde theoretische rendementen (Gool, Jager, Theebe, & Weisz, 2013).

Deze conclusies hebben ervoor gezorgd dat er is besloten om de potentie van Blockchain binnen het vastgoedbeleggingsconcept van Get a Brick verder uit te diepen en tijdens de presentatie van het CIRRE congres te presenteren.

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## 5.2. Darwinism in a Smart City

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The increasing digitalisation of our society splits our world into different camps. People who can and want to cope with the digitalisation and people who already have difficulty with the current developments.

The first group talks about the new options and admires every step forward in this field. Whereas the second group seems to find it an undesired development or keep describing it as a hype that will pass. 'Everything will go back to the old days.'

How to deal with a digitized city, often referred to as a Smart City, where only part of the population understands or desires the new functionalities?

It's a fact that innovations will not stop or return to earlier stages. Disruptive innovation is amongst us since mankind and it is needed to bring new economic opportunities.

We have seen this during prior industrial revolutions, like for example during the First Industrial Revolution (1760) where the invention of the Steam Engine pushed the textile and iron industry to increased efficiency, leading to an enormous shift towards a whole new and different economy. Where prior to the invention of the Steam Engine most of the people hand made their own clothes, furniture and tools at home, with the venue of the new machines more efficient and productive factories emerged leading to new jobs and the demand for new types of products. It was the beginning of mass production. And the beginning of the move towards urban regions.

A similar and maybe faster development was seen a hundred years later during the Second Industrial Revolution (1870), where several new inventions followed one after the other. Enabled by new technologies such as new ways for electric power transmission and new ways of long distance communication, a significant amount of inventions was introduced, helping different markets to become more efficient and to grow. Again a hundred years later, during the Third Industrial Revolution (1969), automation of processes was introduced, making industries even more efficient and able to grow.

So the concept of disruptive innovation is not really new. However, the difference today is that with the current 4<sup>th</sup> Industrial Revolution, which is happening right now, the impact and disruption goes much faster and seems to have more impact than the ones before. Where the first three Industrial Revolutions changed production processes and attracted people to urban regions, this Fourth Industrial Revolution is entering and changing our daily lives in another way. It penetrates into our homes, cars, bikes and even into our minds and bodies by an increased interaction between human and machine, using different types of sensors and applications on top of it, sometimes replacing parts of our human beings.

Due to the latest Industrial Revolution we are challenged to discuss more ethical topics such as 'to what extent do we want machines to make decisions for us' and 'are we willing to outsource our own thinking and decision-making process to a machine'. An even more extreme thought is the idea of Transhumanism, where the aim is to transform the human condition by technologies in order to

enhance the human intellectual, physical and psychological capacities<sup>5</sup>. As with every change we see resistance to all these changes, but on the other side, as said before, innovation is needed and cannot be stopped.

From a scientific point of view, it seems fantastic when brilliant innovations are announced in the press, promising to make our lives easier. Who doesn't want to track his pet or keep an eye on his house 24x7 while not being there? It's great to save money by only switching on the heating in your house while travelling home or your car arriving, because it just knows you want to go on your way home.

The point is if only part of the population understands the latest developments, what will be the impact? Imagine a car, a bill board on the street or a fridge in your house suddenly starts communicating to you and you don't know how to deal with it? What if your 'watch' is not showing the time anymore but very tiny letters and colours and you cannot get any information out of it?

What if you are less interested or less developed in the digital age and long back to the times where you could visit a bank office rather than using a computer or a smart phone or buy a train ticket at the reception with a real human being behind it?

We live in a diverse society where a big part of society is limitedly used to deal with digitisation. And yet we are filling our cities, mobility means and buildings with more sensors and digital devices than ever.

Similar to prior Industrial Revolutions, the ones not keeping up with the new developments and required skill sets stay behind and are less benefitting from the advancements.

Whereas people who are learning all these new skills are in high demand. This last group will get the jobs easier and often better paid. But today it's not only about jobs and salaries. It's starts to become considerably important in order to live or to survive. What if there are no retailers anymore and you can only order fresh milk by leaving this all to the decision-making process of your fridge while you have no clue how to get this all working or to influence it?

Today a lot of us find it pretty standard for our power supplier to read the metrics remotely and to pay by just swiping our bank card over a machine or entering a code online.

We are testing different types of mobility. Like drones, self-driving cars, self-flying airplanes and delivery robots. We outsource our activities more and more to machines. Since innovation will not stop, this will become the new normal and it will impact our lives and requirements.

Picture a fully digitalised house and ditto mobility, equipped with sensors, intelligence and decision making power as the new standard. Would your requirements be different when you search for a house? Is your current house still that attractive and easy to sell? And to whom? The same goes for your car and garage: if we have streets filled with intelligent and self-driving cars, would you still need one of your own or for what purpose would you need a garage at your house? Does this new normal change the location you want your house to be built? Will we still have public transport?

Internet of Things, Blockchain, Artificial Intelligence, 3D printing, Virtual Reality and Augmented Reality were probably not there when your house or car was built.<sup>6</sup>

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<sup>5</sup> *Technology versus Humanity*, Gerd Leonhard

<sup>6</sup> Veuger, J. (2017), *Een wendbare vastgoedeconomie met: Disruptie & Blockchain*.

Did you check how many sensors were in your home or if AI was improving your car? And if you did, did you check the impact on your security? It's only recently that people start to realise they have a digital live next to their physical live and hence they need to think about their digital security too.

Every innovation is based on the latest technologies, disrupting the previous ones. How to adapt to this new world without the required skill sets?

We are entering an era where new technology confronts us with an unescapable situation: we all have to learn digital skills. These skills of the 21<sup>st</sup> century are material in order to survive. With the same eyes we should look at our houses, cars and other belongings. In order to survive we need the right skills and equipment. Our requirements for living, working and mobility will change rapidly, either because we want to or because we are forced to due to the latest developments around us.

### **5.2.1. Digital Twin**

The Digital Twins<sup>7</sup>, as we often call the digital representation of a physical asset, process or system, pushes changes even further. By making a digital version of a physical object, adding intelligence and data we can experiment and develop easier and faster.

In the case of a Smart City we see a similar thing with one difference: a physical and a digital society coexist and interact. The digital version is not there just to simulate the physical one, but it is almost like a second dimension we are living in.

If you are not part of the digital society you will not only miss parts of it, soon you will be left out for a big part.

### **5.2.2. Darwinism in a Smart City**

*"a lot will change and the ones who will survive are not the most intelligent ones but the ones able to adapt to change."*

We know this very true statement for quite some time now. However, until today this was more regarding human behaviour. Today we see the same changes rapidly coming in for objects as well. For example, look at real estate and mobility. Houses without any option for internet connectivity are less popular to say the least. Cars running on diesel are more and more abandoned while electric cars become more and more popular. By the introduction of Blockchain, the concept of Peer2Peer is implemented in many applications and introduces a more distributed society. The distributed concept is not only applied in payments and other finances. It also shows up in areas like energy, sharing economy and contracts in general.

In the long run there is no way we will survive without being part of the other half of society, the digital part.

Today, to fight this undesirable situation of a split in society, where people, houses, cars and other aspects of our daily lives are valued very differently than before the current Industrial Revolution, we have to work hard on awareness and education.

The new options encouraged by new technologies will continue to change our daily lives. We'll have to find a way to deal with the fast digitalisation process. Whether we like it or not.

### **5.2.3. How to survive a Smart City?**

Cities become fuller every day. Leading to annoying situations such as inaccessibility, rising prices and environmental issues. Based on the current technologies many new initiatives come into the market, sometimes offered by start-ups. They bring us new ways to enjoy our lives in the city. Some of them involve digital communities in order to share products, they build and enhance the digital society. Others bring new

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<sup>7</sup> [https://en.wikipedia.org/wiki/Digital\\_twin](https://en.wikipedia.org/wiki/Digital_twin)

platforms where traditional services in areas like finance or health are offered in a more efficient way. In time, due to these new offerings bringing along cost savings, the traditional ones will be pushed out of the market.

In the long run it will become inevitable to need digital skills. In order to survive a Smart City, we will have to find a way to match the speed of developments with the speed of digital awareness and education. It is us who change requirements so it is us to prepare for Future Cities.

It starts with sharing the awareness of the sense of urgency. Things will not go back to the old days as some people say.

Awareness should be followed by education and training. And finally, when people are more educated on the digital society, the implementation and actual use of new platforms and services can be embraced.

By that time we all should be educated about the possibilities and certainly also about threats of the digital society. We will have adjusted our requirements, we know which questions to ask.

During this journey, of becoming more aware and educated, theory and practice work best hand in hand. Funny enough all these new technologies could bring us closer than ever. Assuming the more digitalised citizens want to help the less digitalised. How wonderful would it be if this could lead to more social interaction.

Furthermore, the trend towards a more distributed economy and society could bring us back to where we came from before the First Industrial Revolution: citizens living in both urban and rural areas, where today they have the means for long distance communication, to easily commute and to share and benefit from the latest developments from any place in the world at any time. People would finally move back to rural areas, saving time and environment. The cities would be less crowded, a healthier place to live and with increased accessibility.

Will that be the impact of Smart Cities?

### 5.3. Blockchain and Ownership Through Smart Contracts for Non-Commercial Real Estate

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At the moment, times are changing. Banks are having a very important position in our economic system. In addition, the whole process of buying real estate (commercial and non-commercial real estate) is associated with a lot of players in the field, for example the notary and title companies, who check the ownership of property in a more analogue than digital way. But times are changing currently. The bitcoin, world's most popular cryptocurrency, is worth more than \$10,000 (Bitcoin.com, 2018). It can be seen as the centuries' biggest revolution in the world of currencies.

More than 236,000 transactions are made on a daily basis using bitcoins (Blockchain, 2018). Back in 2008, a scholar and technologist described a revolutionary banking system. He presented a way in which any contract can be smart, by using cryptography and computing protocol. In the same year, America's largest bank fell. On the 2<sup>nd</sup> of November 2008, weeks after the fall, a report was published and gave a direct answer to the question: "What do we have to change in our current banking system?". The answer that was given by Satoshi Nakamoto was to change the banking system and the banks as well (Nakamoto, 2008), by using blockchain: the mechanism of cryptocurrencies. According to this white paper, this new banking system should enforce the security and efficiency of our current system. Banks were even called rudimentary. Nowadays, currencies, stocks, shares, and even real estate are traded using blockchain. So, turning a blind eye to this revolutionary system might be foolish or too ignorant -or might be not. It might be a whole new era or just a façade. The primary question is: *how can blockchain be applied for ownership in real estate, and especially in non-commercial real estate?*

#### 5.3.1. Blockchain

Blockchain is the mechanism, the core-technology of the bitcoin. There are two types of blockchain: 1) permissionless blockchain, in which anyone can read, write and participate, and the 2) permissioned blockchain, in which only consortium members can access information about transactions (Deloitte & Touche LLP, 2017). Both consists of four elements: cryptography, peer-to-peer network, open source protocol and a database, where transactions and blocks can be seen (Veugers, 2017).

The first element (cryptography) is a difficult element. Cryptography is a mathematical technique that consists of algorithms to store, transfer and process information in a secure way. The essential point is that it takes care of the security of the block. Each block typically has a hash that is linked to another block, a timestamp and transaction data. The security-factor of a block is that blockchains are resistant to the modification of data: a hacker can only corrupt a blockchain if he breaks the majority of the blockchain codes, which costs a lot of mathematical effort (Deloitte & Touche LLP, 2017). The second element is the peer-to-peer network. Because of this, the data of the blocks can be transmitted (Veugers, 2017). The open-source protocol provides the transactional information, so anyone can see how the software was programmed- in the blockchain database. In short, the mechanism of blockchain is secure by design, and because of this, it might be usable for all sorts of trades. For example, real estate. But why specifically real estate and how is this implementation possible? Let's find out in the following paragraphs.

#### 5.3.2. Why is blockchain useful regarding to real estate?

First, because of the element 'cryptography', blockchain is highly secure. Each block in the blockchain is resistant to modification of the data, so nobody can change the data in the block. In addition, this block has a hash, so it is linked to another block, a timestamp and transaction data. What happens to a block when it can be monitored using the blockchain database? For a thief, there is no way to escape with a block and to change the data within the block, so it creates a trustless environment (Deloitte, 2017).

Secondly, because anyone can send blockchains (for example bitcoins) to one and another, a trusted third party like a bank is not necessary. People can send each other bitcoins from their digital wallet to another



one's wallet, just in a split second, from all over the world. This means, a digital transaction using blockchain (for example bitcoins) is near real-time. Because of this, it removes friction and reduces risk (Deloitte, 2017).

### 5.3.3. How can it be adopted in real estate?

Blockchain has recently been adapted and adopted for the trade of the commercial real estate (CRE). According to Deloitte (2017), commercial real estate has several advantages using blockchain, if the following prerequisites will be adopted.

First, because of the ledger feedback, there is a database that can be used for leasing and purchase and sale transactions. It provides property level information from private databases of brokers and agents. At any time, brokers and agents can consult this database, without making use of a land registry service/ title company (Dutch: Kadaster).

Secondly, the peer-to-peer network creates a system in which users can access, provide and modify a variety of information. This is very useful in CRE, because in this way, all involved and trusted parties can transact and manage CRE (Deloitte, 2017).

Thirdly, blockchain can be adopted to create digital integrity for the participants in leasing and purchase and sale transactions. This might seem more anonymously, because a persons' real identity is secret. Nevertheless, transparency in title management makes it more secure, because it reduces risk (Deloitte, 2017).

Last but not least, a CRE or non-commercial real estate (now: NCRE) transaction is almost never without any conditional clause. These clauses can be executed using smart contracts (Deloitte, 2017). This means, that under certain circumstances (for instance loan and title clearance), CRE or NCRE can be transferred. Executives in real estate are finding that applying blockchain in smart contracts can play a huge role in the industry. For example, purchase, sale, leasing, management, and transactions can be done using blockchain. But what exactly is a smart contract?

### How Smart Contracts Works

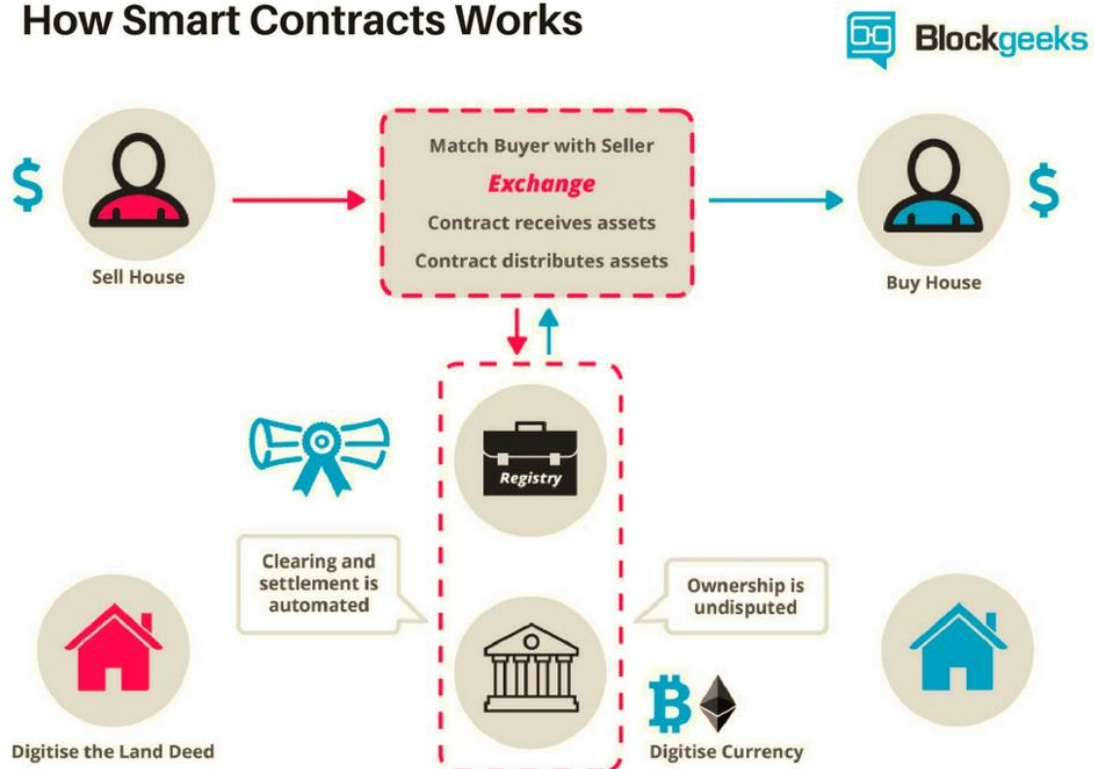


Diagram 1: the mechanism of smart contracts

### 5.3.4. Smart contracts

A smart contract isn't the conventional contract as we know it like today. It isn't a piece of paper that, that has been signed by the people involved in the contract. A smart contract is a computer protocol and encrypted in the blockchain. So, contracts could be converted to computer code, stored, and replicated on the system and supervised by the network of computers that run the blockchain. This is visible in a ledger feedback and allows

transferring and receiving the product or service (Bokhorst, 2016). Blockgeeks.com, a website that provides a lot of information about smart contracts, gives the following example of a smart contract:

*“Suppose you rent an apartment from me. You can do this through the blockchain by paying in cryptocurrency. You get a receipt which is held in our virtual contract; I give you the digital entry key which comes to you by a specified date. If the key doesn’t come on time, the blockchain releases a refund. If I send the key before the rental date, the function holds it releasing both the fee and key to you and me respectively when the date arrives. The system works on the If-Then premise and is witnessed by hundreds of people, so you can expect a faultless delivery. If I give you the key, I’m sure to be paid. If you send a certain amount in bitcoins, you receive the key. The document is automatically cancelled after the time, and the code cannot be interfered by either of us without the other knowing since all participants are simultaneously alerted”.* (Blockgeeks, 2017)

According to this example and diagram 1, it is possible to use smart contracts for all sorts of situations: insurance premiums, breach contracts, property law, financial services et cetera. However, because of the state-of-the-art mechanism, in most of the countries, land registry via smart contracts are not legally recognized. Nevertheless, in Sweden and in certain American States, documenting the buying and selling of land in public records using private blockchain platforms is already possible (Young, 2017).

### **5.3.5. Advantages and opportunities**

The great opportunities for NCRE: it boosts the property search process, decision making, time efficiency, transparency, and cheaper property title management and payments system (Deloitte, 2017).

Because of the open-source database, it is now possible for companies to use this database to evaluate data such as location, rents, capital values, and property features. Nowadays, access to these data asks high access fees. And because the value of the information is not standardized, the quality of the data is not guaranteed and complete dependent of the supplier. This may result in inaccurate, dated or incomplete data (Deloitte & Touche LLP, 2017). As a results, decision making in real estate is faulty. Blockchain can improve the quality of the data by making use of standardized database, so decision making will improve (Deloitte & Touche LLP, 2017). Secondly, because the data can be transferred in a matter of seconds, time efficiency will improve in both NCRE and CRE. In CRE, offline due diligence is time consuming. Physical paper needs to be checked by multiple third-parties, especially when a mortgage is needed, before the deal is on.

Thirdly, according to the American Land Title Association, a lot of trouble and therefore costs is caused by title defects. In America, title professionals need to take extraordinary action to fix this, so ownership can be proved. As a result, these high legal fees causes a lot of financial damage annually, estimated on \$1 billion. Especially in cross-border transactions, this is a huge advantage (Deloitte, 2017).

### **5.3.6. Disadvantages and threats**

Of course, smart contracts aren’t perfect. Instead, they are far from it. Most of the disadvantages are technically of nature. Because a smart contract is nothing more than a visible code, that can be seen in a ledger feedback, it is also sensible for bugs (Grybniak, 2017).

A question that rises, is the matter of privacy. If anyone can get these contracts under their eyes, then what is the sake of privacy? And what about government and government taxes; how to deal with them? (Greenspan, 2016)

Thereby, it begs the question whether it is possible to produce an error-free smart contract, especially when you are a layman. In that situation, a third party like an IT-lawyer is needed to create a smart contract. There it goes, the greatest advantage of blockchain down the drain. (Panetta, 2017)

What about making changes: is it possible to make changes in the smart contract, for example raising or lowering the rent? (Buntinx, 2014)

Concluding, a lot of questions are being unanswered at the moment due to the novelty of the subject. More research is needed to create a useable, technically-friendly environment in which real estate can be traded in a safe and easy way in order to maneuver the old-school, written title documents into checkmate.

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#### 5.4. Blockchain: technology looking for a problem? Visions on the application of blockchain technology in real estate

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At the moment of writing of this article, mid-2018, the topic 'blockchain' was introduced in the real estate industry in the Netherlands about two years ago. Blockchain will have a large impact in the way we share information and make transactions. Its promise is big, interest in the topic and the number of experiments doubles each year, and not only in the Netherlands, but globally too. So you might expect the number of actual 'blockchain products' for the real estate market to follow the same exponential pattern.

In reality, however, this is hardly the case at all. Does that mean there are barely any problems to which blockchain is the solution? Perhaps the problems do exist, but the market is not ready yet? And why not? The two most frequently asked questions in the real estate industry are the following:

1. How will blockchain change my business model?
2. Where can I buy it so that I can employ it tomorrow?

Both questions emphasize the lack of knowledge and experience with blockchain applications in real estate processes. Blockchain is not done alone, it requires a network. As such, it does not only require a change in the business model of your organisation, but also in that of your network partners'. In addition, 80% of the change in the business model most likely has nothing to do with blockchain and all the more with agreements within the network regarding quality and exchange of data. Reasoning from the SiriusDecision model (Sirius 2018), we are clearly still at the front, in the Discovery phase, so it makes sense that few products in the real estate market are currently being purchased.

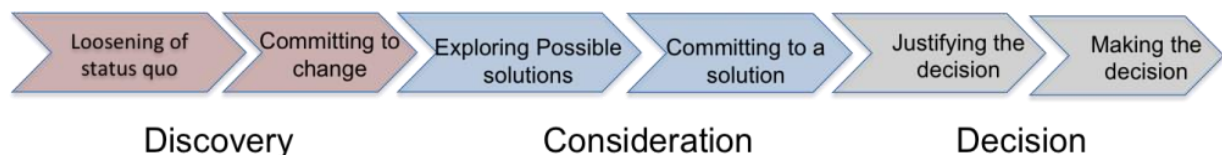


Figure 1: SiriusDecision model, B2B Buyers Process

Let us return to the two questions. The first question can be answered relatively easily: the internet is full of articles with grand prospects, stating that the impact of blockchain could be compared to that of the internet. It is becoming increasingly difficult to find substantiated and real estate-oriented information in this sea of opportunism (Dutchchain 2014, Brounen, Romonesco and Bronckers 2017 and Veuger 2017). Those who delve a little deeper will encounter even more obstacles (Meiklejohn 2017) that raise even more issues for large-scale blockchain implementation. This last group often has the most interesting finds, since they result from actual experiments with blockchain. In other words, these are parties who have gone through the SiriusDecision model once before and who better understand what they are talking about. Specifically for the real estate sector, two obstacles are mentioned that should not be underestimated (Santing 2018): the quality of existing data and the willingness to share data. This puts the finger exactly on the sore spot; who feels compelled?

A recent study (Hagelaars 2018) asked the following question: 'what drives the real estate industry to participate in a blockchain platform?' This research suggests that the commercial real estate industry is a traditional industry, but one that is aware of the technological developments. Real estate parties are not big

innovators, but they are prepared to work with solutions that work more efficiently. This more or less confirms the second question; they see it but are cautiously positive to become a lead innovator. Parties will need to stand up who are willing to take the initiative to set the change in motion. Will these be real estate parties, IT companies or a combination of both? Based on the research results, the first to offer a proven well-functioning product can count on large sales opportunities in the market. In that respect, this is clearly a matter of great opportunities and a clear agenda, namely standardising and developing products! The market is facing a dilemma. What should we start with: develop products first to arrive at more standardisation, or vice-versa?

#### **5.4.1. A good dictatorship rules quicker than democracy**

Less than 200 years ago, the 'modern age' started. The industrial revolution is often cited as the driving force behind it. However, there were other developments with a lasting impact as well. The French revolution had gained a large following in Europe, which led to social chaos and patriotism. Atop the ruins of fragmented feudal Europe, Napoleon put matters back in order. He combined governmental regions and introduced many administrative and governmental innovations that have become essential to us today. The 'Code Civil', for example, formed the basis for the civil law. The introduction of a basic registration in the civil registry or of land properties in the cadastre also originate from this time, as is the adoption of standards, such as the metric system for dimensions and weights, the implementation of street names and house numbers or riding on the right in the quickly growing road network. By why did this happen? What was the underlying problem that had to be solved?

In Napoleon's view, the time of class society had ended. In the new rule of law, every individual was to have equal rights and should thus be able to take care of their own basic matters, in a decentral system. However, the administrative power had to be able to oversee society. The metric system was introduced to make measuring, weighing and calculating all kinds of things easier and more logical. The registration of a person's identity and property allowed the state to collect taxes, fees and tolls on an equal basis. In addition, if everybody kept to the same standard, this would make communication, collaboration and trade a lot simpler. Although this was not the primary intention, the standardisation of definitions and identities formed an important administrative foundation for new business models that completely changed our world during the next 200 years.

And that forms the bridge to current events. We are currently in the age of the fourth industrial revolution, namely the digital revolution. Big data, Virtual Reality, Robotics, Artificial Intelligence, 3D printing, Predictive Analytics, Augmented Reality; it all makes our heads spin. Technological developments are happening faster than society can keep track of and any miniscule detail can be digitized. By why? What is the underlying problem that all this new technology tries to solve?

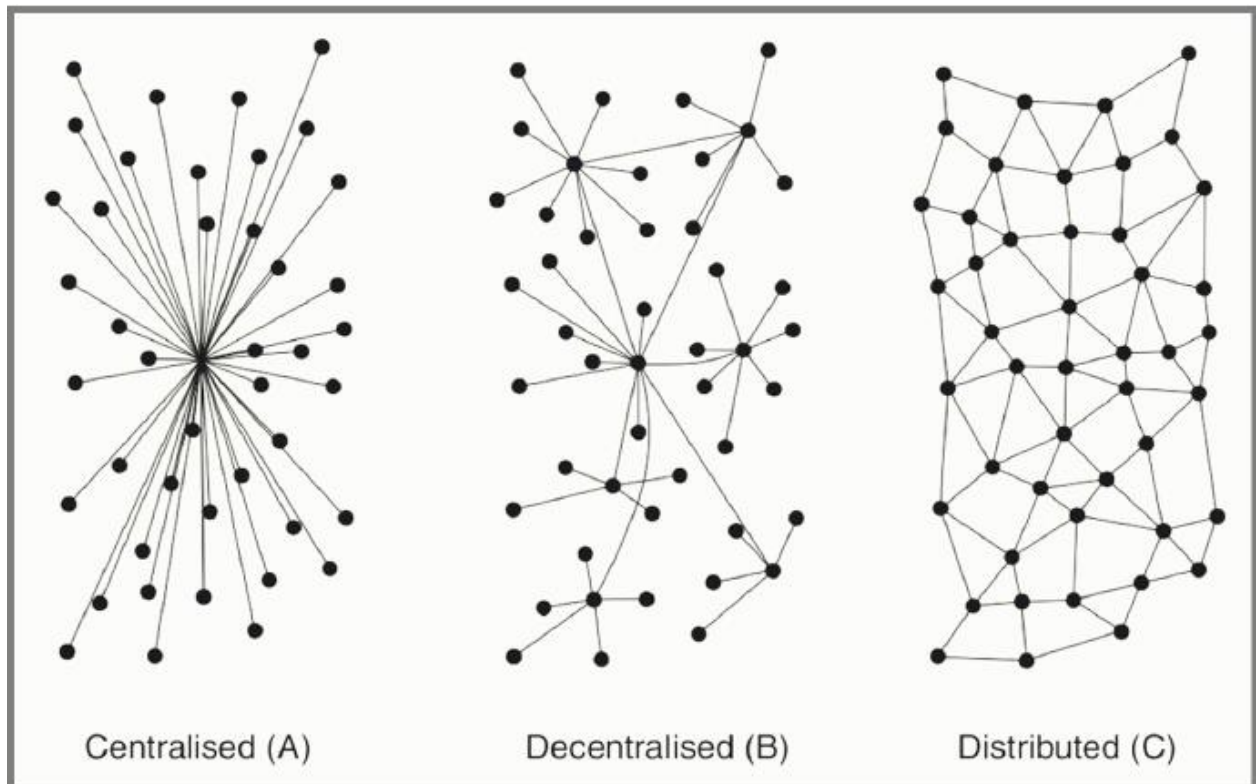


Figure 2: Centralised, decentralised and distributed network models (Baran 1964).

In the meantime, the dominance of tech giants is growing, as well as unrest among the people. Has a new class society been created? As a counterreaction, the individual should have an increased right of self-determination over their own data and, where possible, central management models should become decentral models. Perhaps it is time to conclude that the time is ripe for a thorough renovation of a now 200-year old administrative foundation. For using these new technologies to build new business models in the upcoming years. L'Histoire se repète...

#### 5.4.2. What blockchain does for real estate

Let us remind ourselves of what blockchain is. It is a shared and unalterable administration of facts and transactions where calculation rules replace the central confidant who traditionally supervises the correctness of the administration. You never use blockchain alone but with at least 3 parties, which do not even have equal interests. All parties involved must conform to the agreements in order to trust and use the result of the blockchain solution.

All blockchain applications can basically be divided into 3 different modalities: (1) Unalterable administration, (2) digital transactions, (3) smart contracts.

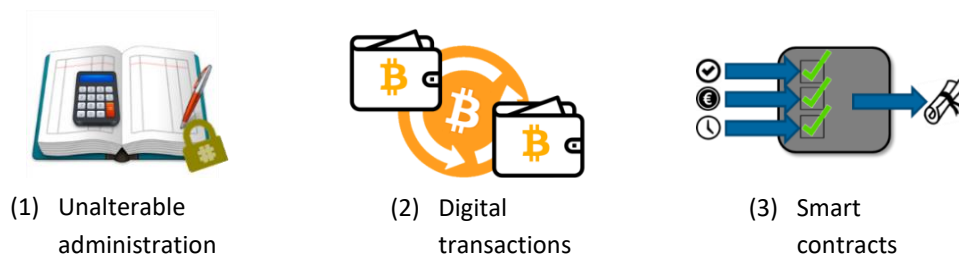


Figure 3: Three basic modalities for blockchain applications.



In the case of unalterable administration, a digital file is documented in the blockchain with a unique digital fingerprint and timestamp by means of a so-called hash function (Youtube 2018). Anyone can see that a transaction took place from the timestamp in question. Only the person who also has the digital file can check, accurately to a T, by reproducing the hash function, whether it regarded the exact same file. Some 'matter experts' might argue that such registrations do not fall under the term 'blockchain' since no transactions take place, but let us leave this aside.

For digital transactions, of which Bitcoin is the most famous example, the digital file is seen as a 'digital asset' (for example, money in the case of Bitcoin) and the owner of it is also determined. Each participant in the blockchain has their personal wallet and the owner can initiate a transaction by means of a private key (comparable to a PIN code). After the network that checks the validity of the transaction has given its approval, the digital asset disappears from the wallet of A and is credited to the wallet of B. From now on, only B has access to the digital asset, by means of their private key. The fact that the transaction took place remains irrevocably visibly documented in the blockchain, but the actual content of it is only known to those directly involved, as it is encrypted with the hash functions. In case of a smart contract, something else is added to these digital transactions, namely that the transaction can take place automatically once a condition that was programmed beforehand has been met. Any required human interaction has been eliminated as much as possible in this last form. The complexity of a blockchain solution is smallest for the unalterable administration and biggest for smart contracts. With regards to added value, the exact opposite applies.

In the Netherlands, various experiments (Examples 2018) started regarding blockchain applications for real estate. These confirm that the more complex the chosen blockchain modality is, the more issues arise. The benefit of blockchain then first becomes a drawback in order to quickly provide a well-functioning product. All conceivable situations and scenarios will have to be considered beforehand, so that the parties can trust that the calculation rules in the solution will always do as promised. However, the result speaks for itself: if the input is sufficiently reliable, compliance and necessary double checks of the output are no longer required! The products that are currently available on the market are mainly based on applying unalterable administration and only very marginally on smart contracts. In other words, these regard documenting, for example, the contents of a complete and signed rental agreement so that it is an indisputable fact to everyone, now or in the future, what the version in question is. Another example is whether this version was later updated to another version (without revealing its contents) and is thus no longer the most current. These solutions are also used to document facts such as maintenance work in a building, or supply chain solutions such as documenting the used materials, as well as their origin and any interim machining.

Some examples of applications of smart contracts in the real estate industry regard so-called tokenizing of a 'real asset', such as a house. A 'digital asset' is created that is the digital representation of that house. That digital asset can be linked to a wallet, allowing for digital money transactions to be simulated from and to the building. For example, the investment or in reverse order the rental income minus costs. It is also possible to split up the token, effectively allowing the property to be distributed under multiple owners. By applying a smart contract, the administration of the transactions can be divided fully automatically, so that each owner is administered a fraction of the transaction, for the part of his share. In this way, you could simulate hybrid property situations or partial rent of certain spaces in a building. Payments to suppliers could also be divided without this resulting in an extra administrative burden.

Since, despite the size of the promise, the matter is often complex and the process of reaching a well-functioning product is tough and long, an ICO (which stands for Initial Coin Offering) is often used. By means of a so-called whitepaper, the intended product is presented to potential investors, who can purchase a coin or token. This effectively buys them a share in the to be developed product. With the revenue of this ICO, the initiators can finance the realisation of the product. You might understand that, considering all the obstacles on this road, this has a high risk and requires a lot of patience.

#### **5.4.3. Uniform data, protocols and IDs**

The real estate chain is a highly fragmented chain with many information exchanges between a large number of involved parties, as well as traditionally many data silos and a large diversity in standards and used software



protocols. The real estate chain can be roughly divided into 5 information domains (Bronckers 2018), with the identity of the building or building part as connecting factor. If the various actors are then also projected, it should not come as a surprise that tedious communication and information exchange is among the top complaints. And that is exactly where blockchain shines, as we just discussed in being able to trust that everyone has the same information. In other words, many use cases are conceivable, but who will allow parties to not only communicate better, but also make them want to communicate?

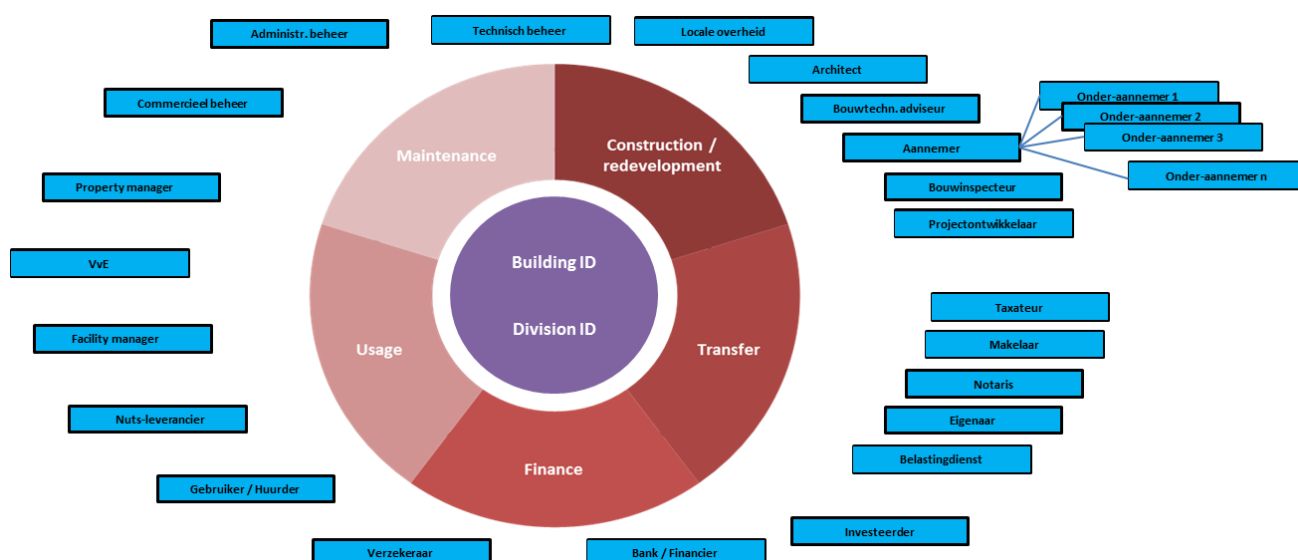


Figure 4: High fragmentation over the information domains.

The real estate column lists various national or international, established or new standardisation initiatives, such as Oscre<sup>8</sup>, Redex<sup>9</sup>, Vastgoedtaxonomie<sup>10</sup>, BIMchain<sup>11</sup>, NEN<sup>12</sup>, ISO<sup>13</sup>, et cetera. These standards provide uniform definitions, data, protocols or IDs within the scope of the specific field of application, which is often still a silo. In other industries, such as the automotive<sup>14</sup> or the international transport industry<sup>15</sup>, the same issue is at hand. Broad consortia are now established to settle barriers, since they want to take maximum advantage of the blockchain potential. Why should this be different for the real estate column? Is it not time that parties who consider themselves trend setters to unify and take the initiative? As history as taught us, new technology for a broadly applicable administrative foundation can lead to revolutionary business models. L'Histoire se repète... Will time tell?

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13 Website ISO

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## 5.5. Technological integration of the 'house of the future': Case study analyses of the integration level of technology for innovative housing projects between 1920 and 2010

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### 5.5.1. Abstract

For many years, numerous innovative housing projects (IHPs) have introduced visions on the future of everyday life by foreseeing the success of various (smart) technologies at home. In general, these projects are thought to be 'futuristic, industrial, expensive and gadgetry' (Mohammadi, 2010). However, many of the experimental technologies of that time have already infiltrated into today's daily activities. Therefore, the motivation of this paper is to explore the integration (level) of technologies into the home environment. The goal of this paper is to analyse the (level of) integration of technology promised in IHPs realized between the period of 1920-2010. This is done by creating an overview of determined IHPs of which the innovative technologies used are identified and analysed accordingly.

The analysis of integration is conducted by creating an overview of the existing IHPs. The sampling unit of the study is determined to thirty-eight (38) IHPs, between the period from 1927 to 2008. The cases are examined based on their following factors: 'date', 'typology', 'goal', 'initiator/designer' and 'prominent technological novelty at that time'. Five typologies come forward in the IHPs: 'conceptual' (ideas transferred to paper), 'showcases' (open exhibition for visitors), 'experimental lab' (monitoring use/adjusted frequently), 'living lab' (monitored and inhabited, but short-term), and 'inhabited dwelling' (taken into production and used). Thus, each IHP is examined individually by visually presenting its factors, and the IHPs in a shared typology are discussed in relation to each other.

The novelty of this study is to synthesize the history of the IHPs through their contribution to the adaptation of (smart) technologies in the home environment as well as in architectural design. The added value lies in the insights of the factors of the cases and how they affect the integration of technology into daily life. In the conclusion, the rate of the necessity of the technologies in the home environment is reconsidered and discussed regarding the impact of IHPs on the architecture of today.

**Keywords:** House of the future - Innovative housing - Case studies - Smart technology - Integration of technology

### 5.5.2. Introduction

Technological developments manifest themselves in large numbers of innovations. Many of them try to find necessary solutions for today's challenges, such as climate change, global warming, or the ageing society (Eisenbrand, 2006; Mohammadi, 2017). Indeed, in the home environment, technology has already made everyday life easier by reducing the time spent on household chores by offering machines which do the work for us, or by providing easy to clean materials (Harper, 2003). The rapid pace of technology makes us dream about what this may bring for the future, and these dreams are exposed in so-called 'houses of the future'. The innovative housing projects (IHPs) often implemented large numbers of state of the art technology as an essential element of the home environment. However, (smart) technology is still more likely to have a higher level of integration in utility buildings rather than in the home environment (Harper, 2003).

The innovative housing projects are often criticized as being 'futuristic', 'industrial' 'expensive' and 'gadgetry' (Mohammadi, 2011). One of the examples of IHPs, that is not yet as successful as expected, is the 'smart home' concept (Leitner, 2015). Literature gives multiple reasons to why smart homes have not yet been implemented on a large scale. The stated main problem is that the smart home concept is technology driven and forces people to live in a home dominated by technology, while in the home environment, the inhabitant should dominate the technology itself (Weiser, 1991; Davidoff et. al., 2006; Mohammadi, Hammink, 2017). On the other hand, the concept of smart home is too much focussed on mass production, efficiency, and productivity, treats which are not suited for the home environment (Leitner, 2015). The technology can successfully be implemented when the technologies adjust to the fundamental human needs instead of the human suiting to the limits of the technology (Slaats, 2017; Mohammadi, Hammink, 2017). Multiple studies mention the problems with the integration of current technology, however, throughout history a large number of technology did manage to integrate successfully in the home environment. Although, a clear overview of these technologies that did integrate successfully in the home environment is still missing.

At this juncture, Koert van Mensvoort (2013) introduces different levels in technology along with the conceptual model entitled as: 'Pyramid of Technology' (van Mensvoort, 2013; van Mensvoort et al., 2015). The level of integration of technology is dependent on the societal environment in which it is introduced. Therefore not only the time path of developed technology is important, but also the societal context in which it is developed.

The goal of this paper is to analyze the (level of) integration of technology promised in IHPs realized between the period of 1920-2010. In order to conduct this analysis, an overview is created of IHPs which met the determined criteria. Subsequently, the innovative technologies applied in the IHPs, are identified and analysed accordingly.

The study is structured as follows: first, the methodology for gathering data is explained together with the criteria that the IHPs need to fit in order to be selected. Then the data processing is elaborated. After this, the gathered data is discussed based on a historical overview and the theory about the 'pyramid of technology' is shortly explained. Following, the conclusion indicates the level of integration of the technology implemented in these IHPs. The paper is ended with a discussion in which possible shortcomings and questions are elaborated.

### 5.5.3. Methodology

Firstly, a literature review conducted with eligible sources brings a list of seventy-three (73) IHPs spread over a period from 1920 to 2020. For this, academic books and scholarly papers are collected by using the keywords: 'Smart', 'Intelligent', 'Technology', and 'Future' in combination with 'Home', 'House', and 'Living'. Then, the elimination of the IHPs with the determined criteria leads to limit the sampling unit of the analysis into a final list of thirty-eight (38) IHPs which were designed between the period of 1927 and 2008.

Following, the selected IHPs are mapped based on their factors; 'date', 'typology', 'goal', 'initiator/designer' and 'prominent technological novelty at that time'. The projects are discussed further by dividing into categories through their typologies. Moreover, the technological integration (level) of IHPs into the home environment is analysed by forming a model inspired by the Pyramid of Technology of Mensvoort (2013).

### Criteria

Firstly, the eligibility of the sources used in the study are determined according to the following criteria:

- The book or paper discusses multiple innovative housing concepts,
- The book or paper provides insight in the goal and the novelty of the IHP,
- The book or paper must contain IHPs which are designed for the Western world (CBS, 2018): Europe (excluding Turkey), North-America, Oceania, Japan and Indonesia.

Secondly, the first obtained IHPs are revised, and the sampling unit of the analysis is determined by the following criteria:

- The IHP does not have to be built, however it must provide sufficient information of the implemented technology,
- Only one IHP of the same initiator/designer per decade is analysed.

### (Level of) integration

By mapping the IHPs, the factors are presented in Table 1 allowing to examine the projects individually. In the overview five (5) typologies are recognized, based on the stage of development of an IHP while it's executed. These typologies of IHPs are 'concept', 'experimental lab', 'living lab', 'showcase' and 'inhabited dwelling'. Thus, IHPs in the shared typology are discussed in comparison with the each other. IHPs which addresses similar challenges are also reviewed with relation to the historical development of technologies in the home environment, these are elaborated in Table 2 and Table 3.

The typologies of the IHPs also become the departure points for the discussion of integration (level) of technologies in the home environment. To draw a conclusion on the impact of IHPs on the societal adaptation of technologies over the years, a model: 'Pyramid of Integration Level of Technology in Architecture' is created by an inspiration from the 'Pyramid of Technology of Mensvoort' (2013).

### 5.5.4. Literature Review

Table 1. Overview of Innovative Housing Projects (IHPs)

| # | year | Cases                        | Initiator/designer         | Typology           | Goal                                                                                                                                                                                                                                                              | Prominent technological novelty at that time                                                                                                                                                                                                                                                                                          | Level of integration over time               | Determining source(s)                                                   |
|---|------|------------------------------|----------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------|
| 1 | 1927 | Dymaxion House               | Buckminster Fuller         | Conceptual         | A sustainable self-sufficient futuristic family house, which can be mass produced and consist of an innovative demountable guy-wire structure (Bergdoll, 2008; Merrin, 2013; Mohammadi, 2014).                                                                    | A guy-wire building structure, which can be mass produced and is quick and cheap to build, water efficient bathroom consisting of a toilet which does not need water, and a shower which uses only one cup of hot water, new communication technologies like radio, television, pramophone and offices amplifiers for home-telephony. | Radio/television = conventional              | Von Vegesack et al., 2006; Bergdoll, Christensen, 2008; Mohammadi, 2014 |
| 2 | 1933 | prefab 'House of Tomorrow'   | George Fred Keck           | Showcase           | Efficiently designed house that is easy and quick to assemble and in which mechanical equipment and building materials are demonstrated in order to show the public that technology and modern design was attainable and probable (Mohammadi, 2014; White, 2017). | Prefab building method, solar energy and experimental air-conditioning systems (Mohammadi, 2004)                                                                                                                                                                                                                                      | Air-conditioning system = necessary          | Mohammadi, 2014                                                         |
| 3 | 1939 | MIT Solar House I            | Hoyt C. Hottel             | Experimental lab   | Experiment with the optimal conversion and storage of solar energy in houses (Von Vegesack et al., 2006).                                                                                                                                                         | Use of solar energy (Von Vegesack et al., 2006)                                                                                                                                                                                                                                                                                       | Solar energy = conventional                  | Von Vegesack et al., 2006                                               |
| 4 | 1944 | Demountable houses           | Jean Prouvé                | Inhabited dwelling | Developing a mass production system for temporary demountable social housing (Bergdoll, Christensen, 2008)                                                                                                                                                        | Demountable and flexible building structure, which can be mass produced and is quick and cheap to build (Bergdoll, Christensen, 2008)                                                                                                                                                                                                 | Demountable/flexible building = conventional | Bergdoll, Christensen, 2008                                             |
| 5 | 1956 | House of the future          | Allison and Peter Smithson | Conceptual         | Generate discussion about how living in the future could look like in a high density area including futuristic technology, which is been made visible in a full scale model. (Von Vegesack et al., 2006; Bergdoll, Christensen, 2008; Mohammadi, 2014)            | Creating private air in a high density environment, self-cleaning bathtub, electric heating bed without blankets, electro-acoustic system that makes contact with the outside world (intercom), big hair dryer. (Alter, 2013; Bergdoll, Christensen, 2008; Mohammadi, 2014)                                                           | Intercom system = conventional               | Von Vegesack et al., 2006; Bergdoll, Christensen, 2008; Mohammadi, 2014 |
| 6 | 1957 | Monsanto House of the Future | Walt Disney                | Showcase           | Promote and show the possibilities with plastic as a building material for a house (Von Vegesack et al., 2006; Mohammadi, 2014).                                                                                                                                  | Use of plastic as a building material, scented air conditioning adjustable to every room, electric washing machine, micro-wave, adjustable light intensity (Weinstein, 2016)                                                                                                                                                          | Washing machine = necessary                  | Von Vegesack et al., 2006; Mohammadi, 2014                              |

|    |      |                        |                                                |                    |                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                        |                                                         |                                                        |
|----|------|------------------------|------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------|
| 7  | 1958 | Afase Solar House      | Peter Lee                                      | Showcase           | An experimental house for conversion and storage of solar energy by rotating photovoltaic cells on the roof (Von Vegesack et al., 2006).                                                                                                  | Use of solar energy (Von Vegesack, Eisenbrand, 2006)                                                                                                                                                                                                                                   | Solar energy = conventional                             | Von Vegesack et al., 2006                              |
| 8  | 1959 | Paris Spatiale         | Yona Friedman                                  | Conceptual         | A second layer of a city on top of an existing city as a solution for housing shortage and allow freedom for the inhabitant without displacing the city below (Von Vegesack et al., 2006).                                                | Flexible grid on top of an existing built environment (Von Vegesack et al., 2006)                                                                                                                                                                                                      | = Conceptual                                            | Von Vegesack et al., 2006                              |
| 9  | 1964 | Capsule Homes          | Warren Chalk (Archigram)                       | Conceptual         | Capsule which consist of highly designed and sophisticated elements inspired by a space capsule, and can be part of the plug-in-city (Zeinstra, 2008).                                                                                    | All elements for living are integrated in a small capsule (Zeinstra, 2008)                                                                                                                                                                                                             | Plug-in capsule = conceptual                            | Zeinstra, 2008                                         |
| 10 | 1968 | Futuro House           | Matti Suuronen                                 | Inhabited dwelling | The goal was to create a small chalet with a light weighted dome structure, which is easy transportable and therefore could be placed anywhere (Von Vegesack et al., 2006; Bergdoll, Christensen, 2008).                                  | Light weighted structure (Von Vegesack et al., 2006; Bergdoll, Christensen, 2008)                                                                                                                                                                                                      | = Inhabited                                             | Von Vegesack et al., 2006; Bergdoll, Christensen, 2008 |
| 11 | 1983 | Xanadu house           | Roy Mason                                      | Showcase           | A low cost dome structured organic home with an integrated computer system in order to shift people view about that a house should be more than a passive shelter, but more like an organic system (Mason, et al., 1985; Mohammad, 2014). | Integrated computer system, which is able to communicate with each other, are applied in each room. For example 'Auto chef' cooked meals at a set date and time. Video texture' windows contained computer generated landscapes that could change by clicking a button.                | Integrated computer system = Inhabited                  | Mohammad, 2014                                         |
| 12 | 1989 | Huis van de Toekomst   | Cees Dam (architect) Christ Titulaer initiator | Showcase           | Exhibiting innovative technologies combined with new spatial and architectural concepts as an answer to demographic and cultural changes (Mohammad, 2014; Titulaer, 1989)                                                                 | Adjustable glass from transparent to opaque, central vacuum cleaner, solar cells, electronic shopping and banking, video printer, LCD television screens (to show for example cookbooks), surveillance cameras, videophone, PC with fax, color printer (Titulaer, 1989; Lammens, 2017) | Electronic banking = necessary                          | Mohammad, 2014                                         |
| 13 | 1989 | TRON Intelligent House | TRON                                           | Experimental lab   | Creating a 'computer everywhere' domestic environment, based on what the people living in a house require and can use. (Von Vegesack et al., 2006; Mohammad, 2014)                                                                        | Video disc system for recipes, automated and monitored goods supply, touch-free toilet (TRON architecture by Ken Sakamura, nd; Mohammad, 2014)                                                                                                                                         | Automated/monitored goods supply = inhabited            | Von Vegesack et al., 2006; Mohammad, 2014              |
| 14 | 1995 | House of the future    | Living Tomorrow                                | Showcase           | Demonstrating innovative and futuristic technology in the domestic environment (Mohammad, 2014)                                                                                                                                           | 1995: Adjustable glass from transparent to opaque, integrated computer in every room (Living Tomorrow, 2012).                                                                                                                                                                          | Adjustable glass from transparent to opaque = inhabited | Mohammad, 2014                                         |



|    |      |                                |                                   |                    |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                     |                                            |                                                                           |
|----|------|--------------------------------|-----------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------|
| 15 | 1994 | Microsoft Home                 | Microsoft                         | Showcase           | Demonstrating how innovative appliances can adapt to the needs of the resident. (Von Vegesack et al., 2006; Nisan, 2014)                                                                                                           | It's scan as door key, computer as central hub and as personal assistant, which is accessible in every room, TV which can pause programs. (Nisan, 2014)                                                                                                                                             | TV which can pause programs = conventional | Von Vegesack et al., 2006                                                 |
| 16 | 1998 | The Aware Home                 | Georgia Institute of Technology   | Experimental lab   | Researching a service development for the elderly based on human - like perception in order to let them live independently for a longer period of time (Intile, 2002; Harper, 2003; Ghaffarian Hosein et al., 2012; Lettner, 2015) | Cameras and microphones, high-speed internal and external connections, a wireless net throughout the whole house enabling communication between cordless devices, a locating application for tracking tagged objects, smart carpet for resident's identification information (Harper, 2003)         | Wireless connection = necessary            | Intile, 2002; Harper, 2003; Ghaffarian Hosein et al., 2012; Lettner, 2015 |
| 17 | 1999 | ComHOME                        | The interactive institute, Sweden | Experimental lab   | Investigate different spheres of home-based activity, for example communication, distance work and social activities, and exploring the impact which technology may have on them (Junestrand et al., 2000; Harper, 2003).          | Home-wide different sensors, voice control application, voice-mediated communication regarding eHealth (Junestrand et al., 2000; Harper, 2003)                                                                                                                                                      | Voice control application = conventional   | Harper, 2003                                                              |
| 18 | 2000 | Hause R128                     | Werner Sobek                      | Inhabited dwelling | Modern passive solar house with an open plan and high transparency to strengthen the connection with the natural surroundings (Von Vegesack et al., 2006).                                                                         | Every item in the house is computer controlled, modular and recyclable building structure, solar cells, seasonal thermal energy storage, self-sufficient in heating (Von Vegesack et al., 2006; Werner Sobek, 2018)                                                                                 | Conventional                               | Von Vegesack et al., 2006                                                 |
| 19 | 2000 | Orange House Of The Future     | Orange                            | Showcase           | Exhibit the use of sustainable technology in the home environment, including generating solar energy in combination with an innovative glass construction (Von Vegesack et al., 2006).                                             | Conservatory of full glass structure, photovoltaic cells, voice controlled coffee machine, smart lock at entrance door allowing to open the door from miles away, automatic locking of the bathroom when someone is inside, wireless internet connection, re-use of grey water (Cellan-Jones, 2001) | Wireless connection = necessary            | Von Vegesack et al., 2006                                                 |
| 20 | 2001 | Media House Project            | MIT Media Lab                     | Experiment al lab  | Researching and developing the concept of the house as a computer, where the structure is the network (Von Vegesack et al., 2006).                                                                                                 | Multiple tiny computer chips inside different objects and elements of the house (Von Vegesack et al., 2006).                                                                                                                                                                                        | Conventional                               | Von Vegesack et al., 2006                                                 |
| 21 | 2001 | The MIT Smart House (PlaceLab) | MIT                               | Living lab         | A house, which can actually be inhabited and simultaneously monitoring the behavior of the resident, in order to conduct data which is freely accessible (Ghaffarian Hosein et al., 2012).                                         | Responsive and adaptive smart devices (Ghaffarian Hosein et al., 2012).                                                                                                                                                                                                                             | = Conventional                             | Ghaffarian Hosein et al., 2012                                            |

|    |      |                                         |                                       |                  |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                          |                                      |                                                                                             |
|----|------|-----------------------------------------|---------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------|
| 22 | 2003 | Living Tomorrow, Amsterdam              | Living Tomorrow                       | Showcase         | Let visitors experience and reflect on the technological developments and new products in daily life in a futuristic building where technology is integrated and individualized (Von Vegesack et al., 2006). | Virtual doorman, which can accept and pay deliveries, smart washing machine, shirt masher which can blow shirts wrinkle-free, automatic supply analyzing and management, smart mirror TV in bathroom, water efficient shower cell which is also a steam cabin, soft polyurethane foam plastic bathtub, adjustable light intensity/color/direct-indirect light, smart board (Arcam, n.d.; Leenders, 2003) | Smart washing machine = conventional | Von Vegesack et al., 2006                                                                   |
| 23 | 2002 | Carbon Tower Project                    | Peter Testa                           | Conceptual       | A skyscraper consisting entirely of composite building materials, mostly carbon fiber, which is environmental friendly and cheap in construction (Von Vegesack et al., 2006).                                | Construction realized from CFRP (Carbon-fiber reinforced plastic), can be printed on site and can be both inner and outer shell. Completely realized without steel, concrete or glass (Von Vegesack et al., 2006).                                                                                                                                                                                       | = Demonstrated edge                  | Von Vegesack et al., 2006                                                                   |
| 24 | 2002 | Philips Homelab, Eindhoven              | Philips                               | Living lab       | Studying how people interact with new Philips products in a fully functional laboratory home in order to better understand customer's needs and motivations to use technology (Von Vegesack et al., 2006).   | Light which can project light patterns, adaptive lightning, smart mirror in bathroom (Von Vegesack et al., 2006).                                                                                                                                                                                                                                                                                        | Adaptive lightning = conventional    | Von Vegesack et al., 2006                                                                   |
| 25 | 2003 | smart house for seniors (Matilda Smart) | University of Florida                 | Showcase         | Demonstrating and prototyping environment for research implementations to support independent living for seniors in a smart living environment (Ghaffarian Hosein et al., 2012).                             | Location tracking system based on ultrasound technology (Alam et al., 2012).                                                                                                                                                                                                                                                                                                                             | = Demonstrated                       | Ghaffarian Hosein et al., 2012; Alam et al., 2012                                           |
| 26 | 2003 | Adaptive house                          | University of Colorado                | Living lab       | Exploring the concept of a home which programs itself, in a way that the smart technology automatically adapts to the needs of the user (Harper, 2003).                                                      | Smart self-learning systems by sensors which monitor temperature, light levels, sound, opening of windows and control devices for heating, lighting, fans (Harper, 2003).                                                                                                                                                                                                                                | = Inhabited                          | Harper, 2003                                                                                |
| 27 | 2003 | MAVhome - Arlington                     | University of Texas                   | Experimental lab | Investigate a combination of multidisciplinary technologies in the home environment: artificial intelligence, multimedia technology, mobile computing, and robotics (Alam et al., 2012).                     | Adaptive technology by utilizing algorithms based on one user (Alam et al., 2012).                                                                                                                                                                                                                                                                                                                       | = Inhabited                          | Alam et al., 2012                                                                           |
| 28 | 2002 | House_n                                 | Massachusetts Institute of technology | Experimental lab | The creation of an environments which fit the physical and cognitive needs of people of all ages, by technology, products and services (Intille, 2002).                                                      | Alarm for medicine use or heart problems, sensors to obtain residents movement information (Intille, 2002).                                                                                                                                                                                                                                                                                              | = Inhabited                          | Harper, 2003; Intille, 2002; Letner, 2015; Tokuyama et al., 2012; Von Vegesack et al., 2006 |

|    |      |                                                                                        |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                         |                                                                                |                                                                         |
|----|------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 29 | 2004 | Ubiquitous Home<br><br>National Institute of Information and Communications Technology | Collection of real-life data for academic purpose of a residential apartment, which is equipped with various types of sensors, network infrastructures and network appliances (Yamazaki, 2007; Ghaffarian Hosen et al., 2012).                                                             | Network infrastructures, networked appliances, robots in home service, several context-aware services, floor pressure sensors (Yamazaki, 2007; Ghaffarian Hosen et al., 2012).                                                                                                          | Networked appliances = conventional                                            | Ghaffarian Hosen et al., 2012                                           |
| 30 | 2004 | Toyota Dreamhouse, Aichi Prefecture<br><br>Ken Sakamura and Toyota Home K.K.           | Developing a 'computer everywhere' sustainable environment, in which human, nature and computer is merged together (Von Vegesack et al., 2006; Ghaffarian Hosen et al., 2012).                                                                                                             | Computerized living space, self-cleaning windows, adjustable lighting and sound systems (TRON Architecture, n.d.).                                                                                                                                                                      | Computerized living space = conventional                                       | Ghaffarian Hosen et al., 2012; Von Vegesack et al., 2006                |
| 31 | 2005 | T-com House, Berlin<br><br>T-com                                                       | Conducting market research on their developed products, such as an interactive message board and video on-demand, by inviting people, potential customers, to live at the house for a determined period (Von Vegesack et al., 2006; Tagespiegel, 2006).                                    | Intercom where the visitor can leave messages for the resident, treadmill with virtual surroundings, interactive/adjustable lighting, rent a movie online, monitors in the floor tell bus/train times, possibility to check on your house when you're not home (Tagespiegel, 2006)      | Interactive lighting and rent a movie online = conventional                    | Von Vegesack et al., 2006                                               |
| 32 | 2005 | The Gator Tech Smart House<br><br>University of Florida                                | Analyzing the effects of assistive intelligent technology, on the responses of the users, with a special focus on seniors and people with special needs in order to let them live independently. (Follow-up of the Marilda smart house) (Alam et al., 2012; Ghaffarian Hosen et al., 2012) | Pervasive Computing technology, smart laundry, smart floor, home security monitor, smart mailbox, smart front door, ultrasonic location tracker, smart mirror, smart bed, smart closet, plasma display (Alam et al., 2012; Ghaffarian Hosen et al., 2012)                               | Home security monitor = conventional                                           | Alam et al., 2012; Ghaffarian Hosen et al., 2012; Tokoyama et al., 2012 |
| 33 | 2005 | Jellyfish House<br><br>IwamotoScott Architecture                                       | Creating a mutable layered skin, that mediates internal and external environments, as a response to the smart home concept, suggesting that the digital technologies will eventually recede to the background of our spaces and experiences (Von Vegesack et al., 2006).                   | The skin is coated with titanium dioxide (TiO2) self-cleaning facade which can block harmful UV rays, regulate sounds, mutate in opacity, transparency, color, light and image. Organic plastic solar cells gain electricity (Von Vegesack et al., 2006).                               | = Demonstrated                                                                 | Von Vegesack et al., 2006                                               |
| 34 | 2005 | Reactive Gap House<br><br>Hoyer, Schindele, Hirschmuller & Partners, Art+ccom -        | Dealing with the lighting problem in narrow building gaps by illuminated ceilings, which are connected to a sensory system (Von Vegesack et al., 2006).                                                                                                                                    | Dynamic illuminated ceiling which can responds to its surroundings (Von Vegesack et al., 2006).                                                                                                                                                                                         | = Inhabited                                                                    | Von Vegesack et al., 2006                                               |
| 35 | 2006 | Dunehouse<br><br>SU11 architecture and design                                          | Creating a sustainable living environment in the desert climate, by merging the building with the desert landscape as a root of a cactus (Von Vegesack et al., 2006; Dail, Buckley, 2010).                                                                                                 | Generative software was used to design the Dunehouse, when a single element was adjusted, connected elements would adjust accordingly. Solar system and fuel-cell generate electricity and heat. Geotextiles shape themselves accordingly the surroundings (Von Vegesack et al., 2006). | Geotextiles which shape themselves accordingly the surroundings = demonstrated | Von Vegesack et al., 2006                                               |

|    |      |                              |                             |                  |                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                |                                                |                                                    |
|----|------|------------------------------|-----------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------|
| 36 | 2006 | Thinking Ahead!              | Rojkind Arquitectos         | Conceptual       | Developing a high-tech home health-care system which can be integrated into any dwelling, in order to monitor and respond to the physical well-being of elderly (Von Vegesack et. al., 2006). | Shower with an ultrasound body scans, a toilet that analyzes bodily fluids and "floataturnus," (Wired, 2007)                                                                                                                                                                   | Footortum = Inhabited                          | Von Vegesack et.al., 2006                          |
| 37 | 2008 | Duke University Smart House  | Duke University             | Living Lab       | Integrating sustainable technology and energy efficiency into the residential design to enhance Quality of Life (Ghafrani Hosain et. al., 2012).                                              | Solar thermal panels which provide 100% of how water needs, green roof to insulate the home and carbon sequestration, the roof has an angle to direct the water to the water collection system. PV-panels which provide 15% of the energy consumption, clean lab with desktops | Everything except the clean lab = conventional | Ghafrani Hosain et. al., 2012                      |
| 38 | 2008 | The CASAS Smart Home project | Washington State University | Experimental lab | Ease living and increase comfort by recognizing and trading the user's activities and simultaneously minimize the maintenance costs (Ghafrani Hosain et. al., 2012; Alam et. al., 2012).      | Adaptive smart home which uses machine learning techniques, a.I., discovers user behavior patterns and mimics them, can identify behavior changes (CASAS WSU, n.d.)                                                                                                            | = Inhabited                                    | Ghafrani Hosain et. al., 2012; Alam, et. al., 2012 |

### **Development of technology at the home environment**

One could say that the development of technology starts with the introduction of electricity, which took place in the first quarter of the 20th century (Aldrich, 2003). Even though currently electricity is fully integrated into daily lives, the introduction of electricity led to fearfulness of the eventual users. Adrian Forty (1986) mentions an anecdote of two elderly ladies who kept the plugs in all of the electrical sockets to prevent the electricity from leaking out. Since electricity was mainly used for lighting, many people only placed one socket, they could not see any use for adding more. This development is recognizable in the Table of IHPs (Table 3), by the 'Dymaxion house' (1927) and the 'House of the Tomorrow' (1933) which are still demonstrating how electricity based technology can be integrated in the home environment. The shortage of domestic servants was seen as an extra stimulation to create electrical household appliances which could reduce the workload of the household chores and should save time (De Rijk, 1998). The extra time left could be spent on for example listening to the radio or watching television (Aldrich, 2003). These technologies had major impact on the daily life. The time-saving technologies, led to higher hygiene standards, which resulted in an increase of time spent on household chores (Schwartz, 1983; Bowden and Offer, 1994). The Smithsons respond to this evolution by generating a discussion with the house of the future project (1956) about how living in the future could look like with even more technology that ease living.

Simultaneously, after the industrial revolution in the 1870s, being able to build quickly and mass produced appears to be important for some innovating housing projects such as the 'Dymaxion House' (1927), 'House of Tomorrow' (1933) and 'Demountable houses' (1944). The housing shortage after World War II was a significant stimulus for the integration of this innovation.

Moreover, the industrialization led to a massive urbanization. The projects 'House of the Future' (1956), 'Paris Spatiale' (1959) and 'Capsule Homes' (1964) are dealing with this issue of overpopulated cities. They propose ideas of how living in a high density area could maintain its quality. Even half a century later the 'Reactive gap house' (2005) is still exploring an answer to the problem of living in a high density area. The objective of this project was to overcome the lighting problem in narrow building gaps by illuminated responsive ceilings. Another approach to the problem of overpopulated cities was introduced by Matti Suuronen in 1968. He developed the 'Futuro House' (1968), which was a small chalet of a light weighted dome structure. The house was easy transportable and therefore no longer restricted by the border of the city, which made it possible to place it anywhere. Over 40 years later the 'Dune house' (2006) project deals as well with making alternative places inhabitable. SU11 architecture and design developed this concept to create a sustainable living environment in the desert climate, by merging the building with the desert landscape as a root of a cactus.

Looking back to the 1960's much time-saving technology became common in the home environment, such as electric razors, washing machines, sewing machines, cookers, kettles. Also, central heating and thermostats became a commonly implemented element of technology in the home (Aldrich, 2003). Most of this technology was oriented to increase the comfort of the user.

The quick development of technology led to hobbyists trying to connect these technologies in their homes, which resulted in so called 'wired homes' (Harper, 2003). The Xanadu house (1983) responds to this by showcasing a home with an integrated computer system in order to shift people's view of a house which should be more than a passive shelter. The project 'Huis van de toekomst' (1989) exhibits interactive technologies such as electronic shopping and banking, LCD television screens (to show for example cookbooks) and videophone. These technologies were combined with new spatial and architectural concepts as an answer to demographic and cultural changes. These projects can be seen as the precursor of the 'smart home'. The term 'Smart Home' was first used in 1984 by the American Association of House Builders (Harper, 2003; Solaimani, et al, 2011). 'Smart Home' can be defined as a home which is equipped with computing and information technology which anticipates and responds to the needs of the occupants (comfort, convenience, security and entertainment) through technology within the home and connections to the world outside (Aldrich, 2003). Some state that a smart home should also address the needs of health, education, and communication (Solaimani et al, 2011). The 'TRON intelligent house' (1989) is the first experimental lab of the study, which is addressing the possibilities of the 'smart home'. Their goal was to create a 'computer everywhere' home environment, based on what residents

would require and use. The 'Microsoft home' (1994) project showcases the opportunities of 'smart home' technology applied in a regular home. The goal was to demonstrate how innovative appliances can adapt to the needs of the resident. The project included interactive technology such as iris scan as door key, computer as central hub and as personal assistant, and a tv which can pause programmes. The platform 'Living tomorrow' developed in 1995 a showcase project of a 'smart home' to demonstrate futuristic technology such as adjustable glass from transparent to opaque and an integrated computer system.

Around the same period when the term 'smart home' was introduced, the term 'sustainable development' was introduced as well. In 1987 the term was for the first time defined in the Brundtland Report (WCED, 1987). Although long before that, there were already several innovating housing projects in which sustainability played a key role; self-sufficiency in the 'Dymaxion house' (1927), solar energy in 'House of Tomorrow' (1933), 'MIT Solar House I' (1939) and 'Afase Solar House' (1958). However, the call for sustainable development in 1987 was a stimulator for these innovations. The 'Orange House of the Future' (2000) exhibit the use of sustainable technology in the home environment, including generating solar energy in combination with an innovative glass construction. The project 'House R128' (2000) took it even one step further by developing a modern passive solar house as an inhabited dwelling with an open plan and high transparency to strengthen the connection with the natural surroundings. Peter Testa responded to the need for sustainable development with the 'Carbon Tower Project' (2002). This project was a conceptual idea for a skyscraper consists of composite building materials, mostly carbon fibre, which is environmental friendly and cheap in construction. Another project which addresses the sustainable development, but regarding quality of life was the 'Duke University Smart House' (2008). This concerns a living lab project aiming for integrating sustainable technology and energy efficiency into the residential design to enhance quality of life. The conceptual project 'Jellyfish house' (2006) introduces a different view on sustainable development by designing a mutable layered skin that mediates internal and external environments, by for example infiltrate land, which suffer from environmental hazards, with wetlands that act as filtration system for contaminated soil. The project also responded to the smart home concept by suggesting that the digital technologies will eventually recede to the background of our spaces and experiences. In contrast to the 'Jellyfish house', the objective of the 'Media house project' (2001) is to research the concept of the house as a computer with the network as the structure. Also the 'MAV home' (2003) investigates a combination of multidisciplinary technologies in the home environment, such as artificial intelligence, multimedia technology, mobile computing, and robotics.

Although even with the further development of technology, the Smart Home has not yet been as successful as expected (Leitner, 2015). Despite of initiatives of several companies and research platforms to gather data about the activity of potential users. For example the 'T-Come house' (2005) an IHP, which is developed by a company to conduct market research on their developed products. They invited people, potential customers, to live at the house for a determined period. Also, the 'Philips Homelab' (2002) was developed to study how people interact with new Philips products in a fully functional laboratory home in order to provide better understand customer's needs and motivations to use technology. In addition, several experimental labs, among others 'ComeHOME' (1999), 'House\_n' (2002), 'Adaptive house' (2003) and 'The CASAS Smart Home' (2008), started on how smart technology could ease living and increase comfort at home. Although this could not change the situation. Literature gives multiple reasons to why this connectivity between technologies has not yet been implemented on a large scale. The main problem is that the Smart Home is technology driven and forces people to live in a home dominated by technology, while in the home environment, the inhabitant should dominate the technology itself (Weiser, 1991; Davidoff et al, 2006; Mohammadi, Hammink, 2017). Moreover the Smart Home is often too much focussed on mass production, efficiency, and productivity, treats which are not suited for the home environment (Leitner, 2015). The technology can only successfully be implemented, when the technologies adjust to the actual needs of people instead of human suiting to the limits of the technology (Slaats, 2017; Mohammadi, Hammink, 2017). Therefore the 'MIT Smart House' (2001) and 'Ubiquitous Home' (2004) projects were developed as a living lab. These are houses, which can actually be inhabited and simultaneously monitoring the behaviour of the resident, in order to conduct real-life data.

The shortage of domestic servants determined an extra stimulus for acceptance of technology at the beginning of the 20th century, whereas the ageing society and shortage of care personnel can be seen as an extra stimulus for

the integration of smart technology into today's home environment. The connected technology is able to communicate with each other to check up on the resident, and may even alert someone, for example the informal caregiver, when something went wrong. In 1998 'The Aware Home' was initiated to increase independence of seniors. The 'Matilda Smart House' (2003) also aimed to improve independence, the 'Gator Tech Smart House' in 2005 elaborated even further on this subject and improved the available technology. The 'Thinking Ahead!' concept, which was developed in 2008, does not only monitor the life of seniors but also responds accordingly. This concept should be able to implement in each available dwelling. The current societal challenge of the ageing society changes the focus of the smart home from comfort to necessity, which may be considered as an extra stimulation for the integration of the smart home in the home environment.

To sum up, this part of the study allows tracing the development of smart technologies in parallel with the IHPs. The integration of the technologies into the home environment over time can be seen as a result of discussing the literature and examples together. However, the differences in the integration levels are still disregarded. Therefore, the following part analyses the IHPs within the detected typologies in the Table 3, and presents results by examining the relationships between the typology and the goals and date of the IHPs. Later on, the model of Mensvoort on detecting integration level of technologies are explained and this part of the study resulted in a reformulated model on integration level of technologies in architecture.

### **Typologies**

As explained in the methodology chapter the IHPs can be divided into five typologies, namely 'conceptual', 'experimental lab', 'living lab', 'showcase' and 'inhabited dwelling', based on the stage of development of an IHP while its executed.

#### *Conceptual*

In Table 1, the projects considered as *conceptual*, consist of IHPs which describe (and visualize) an idea. Among these, the IHPs mainly concern the topic of urbanization along with the problem of overpopulation (Table 3). In these projects the envisioned technology for actually constructing the building and its services is not necessarily developed. An example of a conceptual IHP is the Dymaxion House of Buckminster Fuller (1926). Even though Buckminster Fuller made realistic plans, the actual concept was not realised as designed.

#### *Experimental lab*

The second typology, experimental lab, consists research based projects, such as the 'Adaptive house' (2003) which aims to explore the concept of a home which programs itself, in a way that the smart technology automatically adapts to the needs of the user. All those experimental labs aim to explore and test the needed technology along with their vision in a simulated environment.

#### *Living lab*

The living lab typology goes one step further by actually testing the technology in an inhabited environment, for example the T-com House in Berlin. At the T-com house multiple smart technologies introduced to the audience by building a smart home in the centre of Berlin. People had the opportunity to live in this house for a short period while the initiators analysed the usage of the products and measured which elements of the home were used most. They used the gathered data to bring certain products to the market.

#### *Showcase*

The projects belonging to showcase are realized buildings aiming to demonstrate the technology and to let it be experienced by the public. For example, the 'Monsanto House of the Future' (1957) is a showcase project in order to demonstrate the possibilities with plastic as a building material for a house.

#### *Inhabited dwelling*

The last category is the inhabited dwelling, which consist of houses that are actually taken into production and are inhabited like the 'Futuro House' (1968) of which there are produced over 60 samples. Although the amount of IHPs which were immediately suited to be inhabited is very limited. Among the selected IHPs there are only three examples of an inhabited dwelling.



### Overall

Regarding the historical development, from the 90's almost simultaneously with the rise of the smart home, many experimental labs and living labs were developed (Table 2). In particular, as shown in Table 3, the selected IHPs which are dealing with smart or wired home technology are all determined as either living or experimental lab or as a showcase.

*Table 2. Relation between date and typology of IHPs*

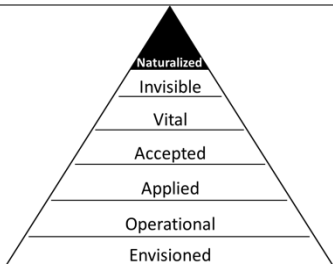
|                    | 20s | 30s | 40s | 50s | 60s | 70s | 80s | 90s | 00s |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Conceptual         | 1   |     |     | 2   | 1   |     |     |     | 5   |
| Experimental lab   |     | 1   |     |     |     |     | 1   | 2   | 4   |
| Living lab         |     |     |     |     |     |     |     |     | 7   |
| Showcase           |     | 1   |     | 2   |     |     | 2   | 2   | 4   |
| Inhabited dwelling |     |     | 1   |     | 1   |     |     |     | 1   |

*Table 3. Relation between typology and goal of IHPs*

|                    | Mass production | Over-population | Smart Homes | Sustainability | Support independent living |
|--------------------|-----------------|-----------------|-------------|----------------|----------------------------|
| Conceptual         | 1               | 5               |             | 3              | 1                          |
| Experimental lab   |                 |                 | 5           | 1              | 2                          |
| Living lab         |                 |                 | 5           | 1              | 1                          |
| Showcase           | 1               |                 | 6           | 3              | 1                          |
| Inhabited dwelling | 1               | 1               |             | 1              |                            |

The typologies of the IHPs lead us to discuss the integration of technologies in the home environment. At this juncture, Mensvoort points out that the term of technology is commonly associated with the latest and unfamiliar innovations, however, technologies include different integration levels. While more time is required for the development of one technological achievement, another technology is a 'natural' part of everyday life. (van Mensvoort, 2013). Thus, he explains each level of technology, also by giving examples as follows:

*Table 4. The Pyramid of Technology (van Mensvoort, 2013; van Mensvoort et al, 2015) (mapped by authors)*

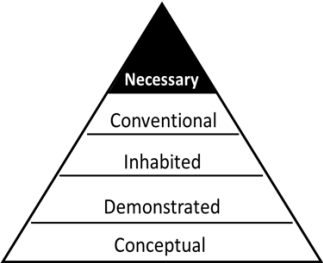
| The Seven Stages of the Pyramid of Technology                                       | Explanation                              | Examples                          |
|-------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------|
|  | Industrialized form of Nature            | Cooking, Writing                  |
|                                                                                     | Intuitive and Authentic                  | Clothing, Money                   |
|                                                                                     | Hard to live without it                  | Internet, Buildings               |
|                                                                                     | Part of our daily life not yet lifestyle | Cars, GPS                         |
|                                                                                     | Once a technology moves out from the lab | Electric cars, Nuclear energy     |
|                                                                                     | Prototype                                | Lab grown meat, 3D printed organs |
|                                                                                     | Need more time                           | Time machine, Space Shuttle       |

By yielding a holistic overlook on technology, this conceptual model demonstrates the process of any technology to be a part of our daily life yet does not try to answer questions regarding technology. It offers a 'tool' for

understanding and developing 'better technology', and can be used by scientists, inventors, engineers, designers, and entrepreneurs. The innovations at the lower part of the seven stages are often criticized as being artificial, unreachable in fact impossible. Nevertheless, one should remember that in a specific point of time all ubiquitous technologies of today all begun from the envisioned level which is the 'most primary' level. On the contrary, technologies at the higher levels seem 'natural' because of being deeply attached to daily life, and not even perceived as technology anymore (van Mensvoort, 2013).

The approach of Mensvoort demonstrates the adaptation process of technologies into daily life, yet a new terminology and stages are required to examine integration levels of technologies in the home environment from the architectural point of view. On this sense, a model: *Pyramid of integration level of technology in architecture* is created. In Table 5, the stages of the reformulated model are explained with the examples related to the housing types.

*Table 5. The Pyramid of Integration Level of Technology in Architecture*

| The Pyramid of the Integration Level of Technology in Architecture                | Explanation                                        | Examples          |
|-----------------------------------------------------------------------------------|----------------------------------------------------|-------------------|
|  | Necessity in architecture as well as in daily life | Dwellings         |
|                                                                                   | Common and ubiquitous                              | Residences        |
|                                                                                   | Lesser known technologies                          | Autonomous Houses |
|                                                                                   | Technologies in an introductory phase              | Robo-house        |
|                                                                                   | An odd idea                                        | Flying Houses     |

The lowest level of this pyramid, *conceptual* stage, determines the starting point of a project, includes the initial ideas and conceptual drawings which may never be planned to realize such as flying houses. Once an innovative project passes the conceptual stage, it becomes *demonstrated* whether by publishing its information or building a prototype. Robo-house can be seen as one example of this level because of developing prototypes and the fact that the concept is not yet widely spread. *Inhabited* stage indicates less familiar technologies in the home environment. Likewise, autonomous houses are currently inhabited by people, but not generally considered as 'regular' homes. *Conventional* stage indicates ordinary technologies known and used in home environment and architecture such as high-rise buildings. Living in a high-rise building depends on the choice of the people, however, the concept of a dwelling serves a vital need of shelter. Therefore, the dwelling is mentioned as an example of the *necessary* stage which is the highest technological integration level in this pyramid.

#### 5.5.5. Conclusion

To draw a conclusion on the impact of IHPs on the integration of technologies in the home environment, the IHPs are placed in the reformulated pyramid. This placement is conducted by considering the circumstances at the time of their first execution.

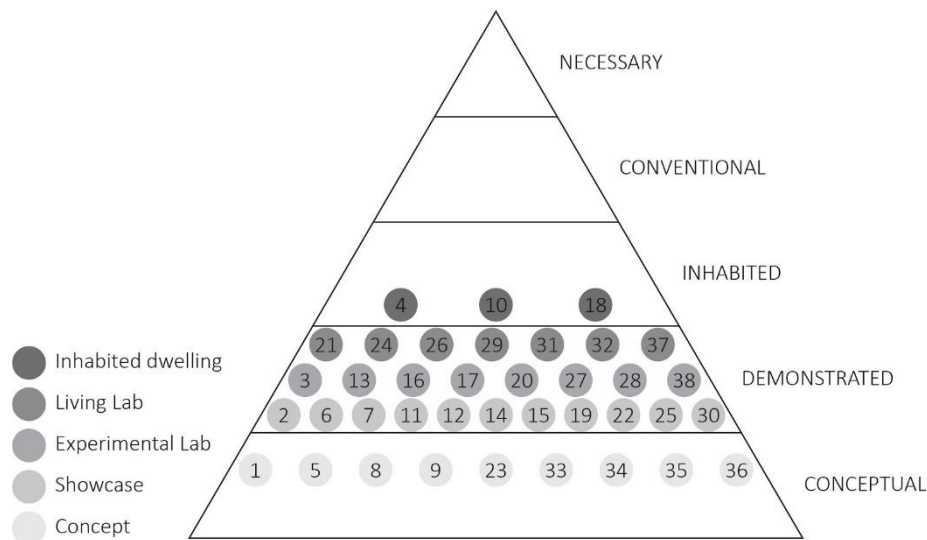


Figure 1. The Technological Integration Level of Innovative Housing Projects

The replacement in the Figure 1 shows that the projects sharing the same typology belong to the same stage. The IHPs which were never realized, but consisted of the sketches and drawings of unfamiliar, new and 'odd' ideas are at the *conceptual* stage. The IHPs in the typologies of showcases, experimental labs, and living labs are at the *demonstrated* stage since all of them indicate monitored and tested prototypes which are built, but not meant to be actually inhabited for long periods of time. The IHPs which are built and inhabited by residents are at the *Inhabited* stage. Figure 1 represents the pyramid of the starting phase of the projects in terms of their first publication and/or construction, so none of the projects are at the conventional or necessary stages and the amount of projects at the inhabited stage is very limited. On the other hand, prominent technologies in this projects climb through the upper stages over time (Figure 2).

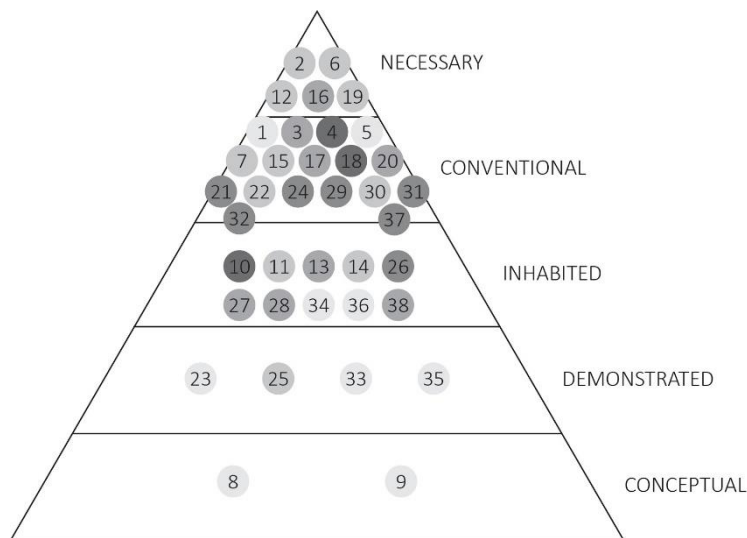


Figure 2. The Technological Integration Level of Prominent Technological Novelties

IHPs comprise variety of technologies as they are included in Table 1. In order to determine the integration level of IHP's, the highest level of the prominent technologies is placed in the pyramid in Figure 2 which formed by taking into consideration of today's circumstances (column 'Level of integration over time' in the Table 1). In contrast to the placement of the similar typologies into same stages, the integration levels of technologies in the projects determine different stages. The comparison of the changes in Figure 1 and Figure 2 concludes that technologies have integrated to life over time. At first, most of them are commonly criticized as being artificial, futuristic and odd, whereas time helps them to become ordinary and necessary part of life.

The examples and their replacement in the pyramids are open to discussion without concrete lines in between those levels. Mensvoort (2013) also places some of the examples in between the phases. Likewise, this study does not try to decrease the role of innovative projects by limiting them to strict levels which can alter through context, people and time. However, this uncertainty does not refute this approach but strengthens by showing the movement and progress of technologies from one stage to other. In other words, rather than the determination of the integration levels of technologies, it is important to distinguish and be aware of the different integration levels of the technologies in the home environment.

#### **5.5.6. Discussion**

The books and papers used to create this overview provided a large number of IHPs that are realized in the last two decades. This may suggest that, over time, the interest for IHPs increased and resulted in a growth of this concept. However, since this overview does not states that it is complete, it can also mean that the main focus lies on recent IHPs. It is possible that IHPs of the past have lost interest and are not found within the used search words. A future research would be necessary in order to clear this point of discussion.

The overview in Table 1 shows that most of the IHPs are actually built, either in the shape of a showcase or a lab. This is something that may be caused by the fact that the IHPs become less ambitious and can actually be built when developed. IHPs which cannot prove that what they mention is actually possible may even be ignored by the large audience. However, it can also mean that the technology improves that quickly that it becomes actually possible to build what is envisioned.

The overview also points out that IHPs can share the same goals and objectives, even though they are spread over the timeline. Sometimes the same technology can be mentioned as a solution to different societal challenges. For example, the demountable houses of Jean Prouvé (1944) had the goal to provide social housing which could easily be built and mass produced. Currently, the demountable house is seen as a technology which is sustainable. In both cases the technology solves the problem, however, whether the technology gets integrated is dependent on how society accepts this technology.

Figure 1 and Figure 2 demonstrates the integration of the proposed technologies in the IHPs. Figure 2 shows the current level of integration considering the most successful technology introduced in the IHPs. This may result in a biased result where it seems as some technological innovation did not integrate well in society, however, the mentioned technological innovation may already have lost its relevance. For example, the landline phone used to be very important, however, today it is less common to have one. This does not mean that the goal of this technology has changed, it has only been replaced by a new technology which is better at executing this goal. In the case of the landline phone, that would be the mobile phone, which has almost become a necessity. In other words, technologies which assumed to be disappeared are in fact deeply integrated into daily life, yet the interface is changed.

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## 5.6. Digitalization Real Estate on American Real Estate Society 2018: A Dramatic and Irreversible Shift in Real Estate Systems

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The 34th annual congress of April 10-14 this year took place in Bonita Springs (Florida) where the professionals in real-estate education and research discussed six themes: global economy and capital flows, real estate market cycles, demographic effects, future-proof real estate, disruption in technology and future educational models.

The six themes of this congress were the result of the more than 120 participants who participated in the Critical Issues Seminar in Coronado, San Diego last year. As with the previous nine years of these ARES meetings, the central goal of the meeting is to focus on education and research strategies and action plans that can close the gap between the real estate profession and the academic world. This makes real estate education and research more relevant and better utilized within the various professional and academic sectors of the real estate economy. The large variety of the many panels that took place included many different perspectives in 105 sub-sessions.

The influence of technology on the valuation of real estate is also presented in various themes. The impact of technological changes on real estate and the real estate sector is considerable. Proptech is developing very fast, but can this be expressed in a valuation of real estate as we can and should do with sustainability? Big data too - we have a lot of data, but do we know how to ask the right question to make this data accessible? - will influence the potential impact on demand, supply and financing. All questions that the Congress tries to answer with many researches. In seven presentations of research into the digitization of real estate and its influence on the development of real estate, two of the 105 sessions presented, explained and commented with approximately 500 participants: (1) Technology & Housing Dynamics and (2) Big Data & Urban Dynamics:

|   | Research                                                                                                                       | Author(s)                                                                                                                                           |
|---|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The Impact of Blogging on the Key Metrics of Price, Marketing Time, and Likelihood of a Transaction for Residential Properties | Ksenija Bogosavljevic, Denise H. Gravatt, and Ken H. Johnson (Florida Atlantic University)                                                          |
| 2 | Twitter and Housing Markets                                                                                                    | Kimberly Winson-Geideman (University of Melbourne), Triss Ashton (Tarleton State University), Nicolas Evangelopoulos (University of North Texas)    |
| 3 | Business Case Qklinker: A Digital Housing Corporation in the Netherlands                                                       | Jan Veuger (Hanze University of Applied Sciences), Danielle Koeken (Mitros)                                                                         |
| 4 | Real Estate Transport Protocol: A Hub-and-Spoke Messaging System for Next Generation Multiple Listing Services                 | Corey Leong (University of Central Florida)                                                                                                         |
| 5 | Digital Cities: Real Estate Development Driven by Big Data                                                                     | Herman Alexander Donner (Royal Insitute of Technolgy, KTH), Kent Eriksson (Royal Insitute of Technolgy, KTH), & Michael Steep (Stanford University) |
| 6 | The Driving Forces Behind Real Estate Digitalization                                                                           | Daniel Piazolo (THM Technische Hochschule Mittelhessen)                                                                                             |
| 7 | A Real Game Changer in Real Estate: Blockchain                                                                                 | Jan Veuger (Hanze University of Applied Sciences)                                                                                                   |

### 5.6.1. The Impact of Blogging on the Key Metrics of Price, Marketing Time, and Likelihood of a Transaction for Residential Properties<sup>i</sup>

Bogosavljevic, Gravatt and Johnson (2018) writing in their abstract that ‘digital marketing decisions are no longer solely in the hands of real estate brokers. Property sellers not only determine if the property will appear online (or not); they also decide what, if any, other digital marketing efforts may be associated with their online property listing. This is due in large part to a settlement between NAR (National Association of Realtors) and the DOJ (Department of Justice) concerning third party comments. In this study, we examine the impact of the seller’s choice to allow third-party comments concerning their residential property wherever it is posted online. The field definition coded as *blogging* in many MLSs (Multiple Listing Services) is investigated for its effect on property price, property marketing time, and the likelihood of a transaction of a property during a given marketing period. Findings suggest that *blogging*: (a) has a positive impact on selling price, (b) slightly reduces marketing time, and (c) leads to a notable increase in the probability that a property will sell and close during a given marketing effort. This new knowledge should allow for a better understanding of the impact of digital marketing, in general, and *blogging*, in particular, as the industry moves forward into an environment of greater and more intensive digital marketing efforts.’

### 5.6.2. Twitter and Housing Markets<sup>ii</sup>

Winson-Geideman (2018) states in her abstract that ‘this research analyses the content and sentiment of Twitter data collected over a four-year period from mid-2013 through mid- 2017. The data were collected using scripts written in the programming language R that were specifically designed to capture Tweets containing hashtags or terms related to houses, house prices, and mortgage/interest rates. Data were captured on a daily basis, and the raw data set includes almost 14 million Tweets. The specific hashtags and terms that were collected and are relevant to this research include: home price, home value, housing, house price, houseprice, housevalue, home, housing, inflation, interest rates, interestrates, mortgage rates, mortgage, and mortgagerates. Other terms and hashtags collected include: condo, realestate, real estate, and realtor.

Tweets are categorized into two groups—the first related to house prices and the second to mortgage/interest rates. They are also grouped on a monthly basis and retweets (RT) and duplicates removed. The data are analyzed using Latent Semantic Analysis for topic extraction and lexical based sentiment analysis, which produces a scoring index that describes sentiment, opinion and/or emotion (Liu, 2015). A dictionary approach is used for sentiment analysis, where the text (Tweets) are compared against lists of positive and negative words. Both programs are run in R.

While we continue to work through the details of the topic extraction, the preliminary sentiment scores appear to contain the type of information that may be useful to predictive modeling. The following graph shows the difference between the score for month  $t_i$  and the preceding month for the sample of Tweets using the term house price. While there is a noticeable fluctuation amongst the monthly scores, the time series also shows some noticeable trends as well as extremes that may provide insight to future analyses. We expect to develop this into a 3-month rolling average, reflecting the averages used in well-known house price indices. It is important to note that what is shown is very preliminary and strictly for example purposes.

This subject of this research paper will be limited to the results generated from the sentiment and content analyses. The expectation is, however, that in future studies the data will be fitted to regression models using mortgage and house price data as dependent variables to explore and estimate the predictive nature of Twitter content and sentiment. The framework for this research is drawn from Asur and Huberman (2010) study that uses Tweets to predict box office revenue for films and the Bollen, Mao and Zeng (2011) research that uses Twitter to predict movements in the Dow Jones Industrial Average.’

### 5.6.3. Business Case qklinker: a digital housing corporation in the Netherlands

Making progressive decisions in the current market organization is complex (Veuger and Koeken 2018). In view of the exponential growth of digitalization and the related possibilities such as the modernization of service, it is crucial to be able to act completely freely. This implies, among other things, that no restrictions are imposed on the past. This includes, for example, current processes, tenant expectations and the current ICT landscape.

Therefore, it was chosen to gear up and crystalize these ideas in the form of a start-up. An all-new, digital corporation, powered from the smartphone. This offers the opportunity to start with a sharp digital vision and the pursuit of a future-proof Mitros. This new startup will be incorporated under the name qlinker.

As much as it is difficult to accurately evaluate costs, it is also difficult to predict the returns and cost savings. However, based on the characteristics of the organization and vision of qlinker, an estimate can be made in regards of the cost savings. In this way, business processes will be more efficient and effective, resulting from digitalization with lower operating expenses: (a) qlinker is expected to reduce operating expenses by approximately 10%, (b) digitalization, coming with a high degree of automation will streamline the work flow. A cost saving of 5% - 30% is considered to be achievable; these include capacity costs, waste costs, transaction costs, process costs, etc. In contrast, new costs may also arise for investing in resources and (new types of) functions within qlinker and applying a customer centric approach to the device application not only eliminates all the wastes linked to the process but also helps focus on the customer.

#### **5.6.4. Real Estate Transport Protocol (RETP): A Hub-and-Spoke Messaging System for Next Generation Multiple Listing Services<sup>iii</sup>**

Leong (2018) states in his abstract that ‘current Multiple Listing Services (MLS) operate as isolated systems due to tight coupling to their local markets and a lack of interoperability for provisioning listings outside of their local areas. Moreover, these legacy MLSs act as controlled gateways eliminating a network effect for maximizing marketability of listings to non-local buyers. This paper proposes a new, distributed messaging protocol called Real Estate Transport Protocol (RETP) for resolving weaknesses and inefficiencies present in today’s legacy MLSs. RETP provides a fire-and-forget messaging transport over assigned Internet port 32811. Implementing a virtualized infrastructure, RETP’s messaging protocol creates a hub-and-spoke network topology for provisioning listing messages to a centralized hub from connected nodes acting as network spokes similar to FedEx’s package shipping model. The results of this research offer three messaging use cases: node to hub, node to hub to node, and then finally, node to hub to multiple nodes. Immediate benefits realized from the implementation of RETP include, but not limited to, network scalability, data redundancy, and the potential of a national multiple listing service.’

#### **5.6.5. Digital Cities: Real Estate Development Driven by Big Data<sup>iv</sup>**

Donner, Eriksson and Steep (2008) states in there abstract that ‘urban environments are composed of urban population, urban infrastructure, city governance and commercial markets within cities. The rapid growth of emerging technologies for sensing and communicating data is being leveraged by commercial companies to create digital applications where machine learning applications analyze multiple kinds of data now available from instrumented infrastructure, public and private urban transactions and citizens’ mobility to transform urban environments. This kind of transformation is our view of what enables a “digital city”. Commercial markets are at the heart of this concept, with commercial applications of digital infrastructure rapidly developing, because data from multiple sources are more easily available and analyzed across multiple data layers drawn from different sectors and regions of the city. It is now possible to visualize multiple kinds of outcomes across an entire city and its markets, and to do “What if?” analysis using predictive analytics to generate new insights and financial models across a wide range of vertical urban services. The ability to visualize real time data and insights drawn from that data about the urban environment that surrounds real estate and identify its connection with real estate value provides an unprecedented potential for enhancing real estate development decisions, primarily through better forecasts for building utilization, more accurate assessment of the purchasing power of users of real estate, and by better risk assessment of real estate users. This article presents an analysis of the potential benefits of digital cities for real estate development decision making.’

#### **5.6.6. The Driving Forces Behind Real Estate Digitalization**

Piazolo (2018)<sup>v</sup> presented his research The Driving Forces Behind Real Estate Digitalization at the American Real Estate Society Congress in Florida. He presented his research results in four chapters: (1) data and digitalization, (2) digital business models and applications, (3) digital business models and driving forces and (4) hypotheses about developments in the real estate area.

When we look at data and digitalization we see a couple of movements: (1) data are the new currency of our time, (2) artificial Intelligence is the new electricity (Andrew Ng Baidu<sup>vi</sup>), (3) digitalization is not the implementation of another software, (4) digitalization is the change of the business model, (5) key activities are data Generation, data interpretation, distribution of insights and (6) value creation chain moves from the real world into the virtual world. Based on an inventory (Piazolo, 2018) of business models on the basis of digital technologies and applications he comes to the next overview.

|   | <b>Business Model</b>     | <b>Application</b>                           |
|---|---------------------------|----------------------------------------------|
| 1 | Crowd Investment          | Online investment products                   |
| 2 | Big Data / Smart Data     | Data management, analysis, reports           |
| 3 | BIM / Property Management | Efficient use and management                 |
| 4 | Online Brokerage          | Digital broker                               |
| 5 | Online Market Place       | Digital consolidation                        |
| 6 | Smart Building            | Use of sensors and Internet of Things        |
| 7 | Smart Services            | Digital contracts and transaction management |
| 8 | 3-D-Printer               | Flexible production and layout               |

*Source: Business models on the basis of digital technologies and applications (Piazolo 2008)*

An example from application to driving force is the business model smart services and application digital contracts and transaction management: computer algorithms to represent contracts or to support execution of contracts. Additional written fixing of contracts becomes redundant and many types of contracts become self-executable. Benefits for smart contracts are higher safeness of contracts and reduction of transaction costs. The driving forces of smart services are new standards and new processes. Thereby Piazolo (2018) presented an overview of business models on the basis of digital technologies and driving force.

|   | <b>Business Model</b>     | <b>Application</b>                           |
|---|---------------------------|----------------------------------------------|
| 1 | Crowd Investment          | New offer                                    |
| 2 | Big Data / Smart Data     | New contents and new insights                |
| 3 | BIM / Property Management | Raising efficiency / Increasing transparency |
| 4 | Online Brokerage          | Raising efficiency                           |
| 5 | Online Market Place       | Increasing transparency                      |
| 6 | Smart Building            | New offer                                    |
| 7 | Smart Services            | New standards and new processes              |
| 8 | 3-D-Printer               | Enhancing flexibility                        |

*Source: Business models on the basis of digital technologies and driving force (Piazolo 2018).*

As Piazolo states in his presented research results are the driving forces of digital technologies: (1) increasing transparency, (2) raising efficiency, (3) enhancing flexibility and (4) enabling new opportunities, new contents, and new insights. These four formative characteristic will also describe future new developments in real estate within a few years. Piazolo concluded that Companies that fulfill with their business models these characteristics will prevail against competition and otherwise crowding out through competition. He also mentions a couple of hypotheses for discussion for digitalization and real estate: (1) transparency-pressure will increase, (2) platforms will continue to gain importance, (3) frictionless execution of all secondary processes around bought product is expected, (4) quality and credibility are demanded, (5) power of control about data as important as staff and (6) processes automated, but staff is more flexible.

#### **5.6.7. A real game changer in real estate: blockchain**

Does real estate still have the value that it once had, or will the valuation of real estate change due to surprising products and services, innovative business models, different market strategies, innovative ways of organizing and managing in the (real estate) markets? Innovation revolves around good facilities in an attractive and stimulating environment. Take disruptive real estate. The driving force behind these developments are new technology,

viability, organizing differently and managing, and these have a big impact on the valuation of real estate. Established names like Nokia, Kodak, Blockbuster, Oad, Free Record Shop, Hyves and V&D collapse, and others, like Hema, Shell, hotel chains and healthcare institutions are the least bothered by it. However, disruptive organizations like Amazon, Zalando, Uber, Tesla and its competitor Faraday Future, who wants to exceed Tesla in everything, clearly respond to viability in the environment, and this is determinative for competitive strength and thus impacts the current and future valuation of real estate. Blockchain – a distributed database that contains a growing list of data items and that is hardened against manipulation and counterfeiting - plays an important role in that. The notaries and brokers have already experienced this in the recent period, and it will continue to have an effect on real estate owners, financiers, users, builders, brokers, notaries and the cadastre. The real estate world finds itself at a tipping point of a transition: a dramatic and irreversible shift in (real estate) systems in society. This abstract based on research (Veuger 2018) is a State of the art of Disruption, Blockchain and Real Estate in the Netherlands and international.

### 5.6.8. Conclusion

In conclusion, we can draw seven conclusions from the studies described above:

- Findings suggest that *blogging*: (a) has a positive impact on selling price, (b) slightly reduces marketing time, and (c) leads to a notable increase in the probability that a property will sell and close during a given marketing effort.
- The expectation is, however, that in future studies the data will be fitted to regression models using mortgage and house price data as dependent variables to explore and estimate the predictive nature of Twitter content and sentiment.
- A cost saving of 5% - 30% is considered to be achievable; these include capacity costs, waste costs, transaction costs, process costs, etc. In contrast, new costs may also arise for investing in resources and (new types of) functions within qlinker and applying a customer centric approach to the device application not only eliminates all the wastes linked to the process but also helps focus on the customer.
- The results of this research offer three messaging use cases: node to hub, node to hub to node, and then finally, node to hub to multiple nodes. Immediate benefits realized from the implementation of RETP include, but not limited to, network scalability, data redundancy, and the potential of a national multiple listing service.
- The ability to visualize real time data and insights drawn from that data about the urban environment that surrounds real estate and identify its connection with real estate value provides an unprecedented potential for enhancing real estate development decisions, primarily through better forecasts for building utilization, more accurate assessment of the purchasing power of users of real estate, and by better risk assessment of real estate users.
- As Piazzolo states in his presented research results are the driving forces of digital technologies: (1) increasing transparency, (2) raising efficiency, (3) enhancing flexibility and (4) enabling new opportunities, new contents, and new insights. These four formative characteristic will also describe future new developments in real estate within a few years.
- The real estate world finds itself at a tipping point of a transition through blockchain: a dramatic and irreversible shift in (real estate) systems in society.

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## **5.7. Digital Twin Offers Huge Opportunities for Real Estate Life Cycle**

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The real estate sector can no longer think about a bunch of isolated real estate objects. When designing, constructing and managing buildings now and in the future, creating a Digital Twin will help with the transformation needed to put users and their environment at the heart of the built environment.

A Digital Twin is not a new concept. Dr Grieves of University of Michigan wrote the first publication on this subject back in 2002. NASA has been working for years on complex digital models that are an exact copy of reality. When disaster struck Apollo 13, NASA used mirrored systems (the predecessor of the Digital Twin) to save the Apollo 13 mission. Currently, NASA uses Digital Twins to develop new recommendations, route maps and the next generation of space vehicles.

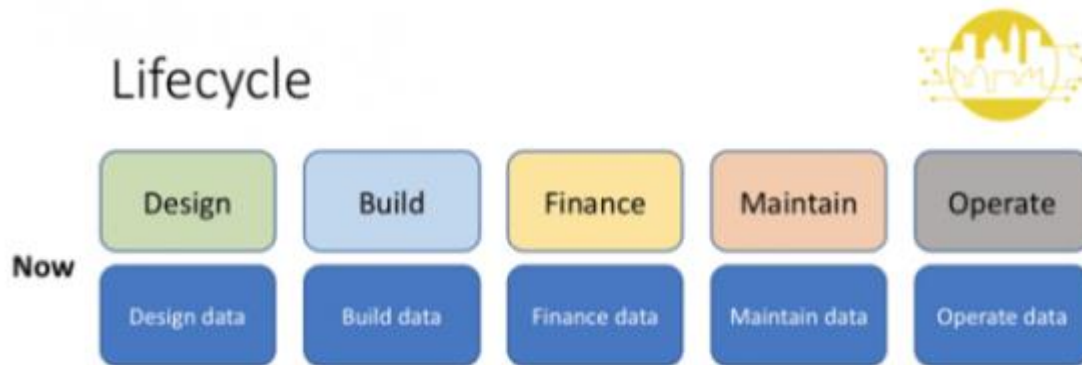
Research and advisory company, Gartner, predicts that by 2021 half of the large industrial companies will use Digital Twins for better research and development results, with hopes to improve effectiveness by 10%. Digital Twins will provide help in the short term with the architecture, engineering and construction of real estate. I predict that the sector will also use Digital Twins in the next five to 10 years to increase management, flexibility, reliability and effectiveness of assets.



### 5.7.1. Fragmentation causes inefficiency and lifeless objects

The sector is still fragmented when it comes to disciplines (design, construction, property management, etc) including the use of data. This causes rising costs and inefficient processes. Learning capacity is low, the adaptation of new technologies is slow, and bricks are robust and static, so innovations are of an incremental nature. If we include the living environment, this fragmentation also has a negative impact on raw materials, energy consumption, traffic and health.

The real estate sector is dominated by people with an architectural, managerial, or financial background. This ensures the sector is thinking and talking bricks, transactions and financial gains. With that, the real estate sector is trapped in old organisational and business models from the 20th century.



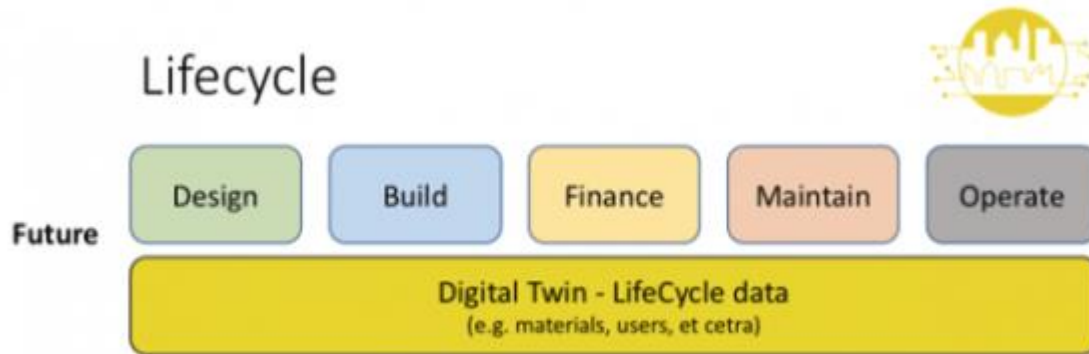
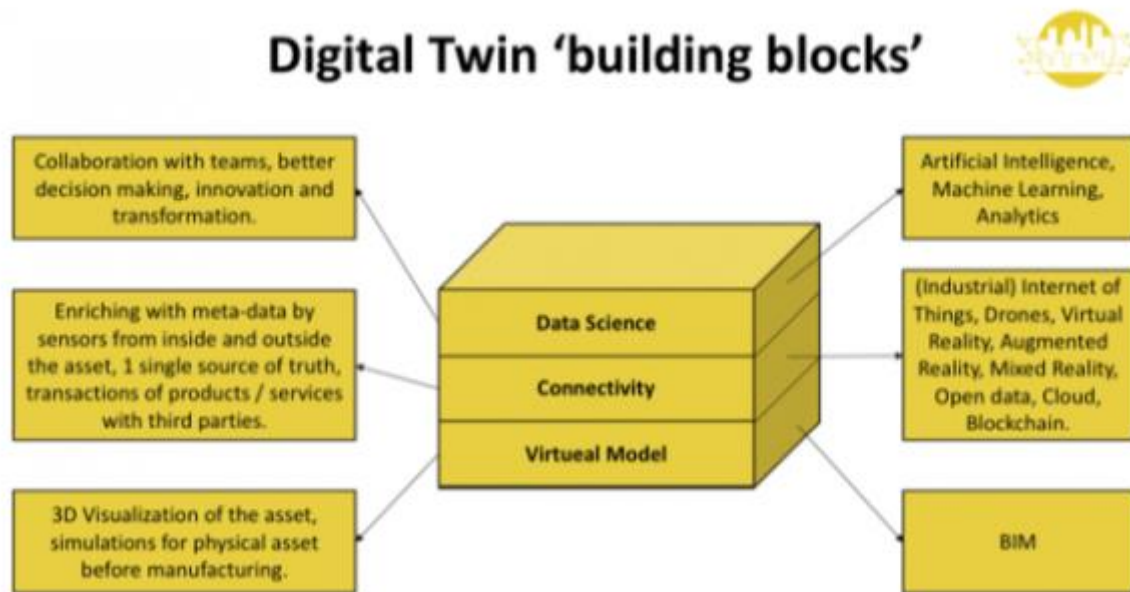
### 5.7.2. Take a leap

Technological developments can contribute to the future of real estate, society, and quality of life. The Dutch real estate sector has the potential to take a leap to become an international progressive living environment. One of the building blocks to make this leap is the Digital Twin. The real estate sector has been using 3D digital models since 2000. We now know that failure costs during the construction process are reduced thanks to collaboration between multiple disciplines. At the end of last year BAM Infra became the first construction company in the world to have both the PAS 1192-2 (Design and Building) and the PAS 1192-3 (Asset Management) BIM Level 2 certifications.

### 5.7.3. Evolution towards a Digital Twin

A Digital Twin is much more than just a 3D BIM process, but what is a Digital Twin? A Digital Twin is a dynamic virtual representation of a physical asset, with which companies can better understand the performance of their assets, make predictions and find new income-enabling companies to change their function in the market.

To bring real estate objects to life, we can install various sensors which data can be collected from. We can measure the performance of a building by using self-learning algorithms (Artificial Intelligence) and data analysis, to solve problems in a shorter amount of time and reduce costs. The building turns into a smart building with significant added value.



Digital Twins also enable the next step; development towards responsive buildings, which will address the needs and wishes of the users in real-time. Insight from data analysis in responsive buildings is used automatically to enhance user performance. For example, controlling installations based on specific users, enabling services and (pro-actively) informing users. Digital Twin technology helps real estate companies better understand the clients' needs, allowing more relevant improvements to be made on products, services and value models that significantly improve the customer experience.

Once the technology is fully embraced, the whole focus and structure of the company can change, eliminate old roles, create new ones, and potentially generate entirely new revenue streams.

#### 5.7.4. Towards an Internet of Digital Twins

If a landlord connects various 'independent' digital real estate objects, an Internet of Digital Twins will be created. The learning capacity over buildings, neighborhoods and cities as integrated systems will be enhanced by this, because data can be monitored and analysed in real-time. This provides valuable insight to livability and health of living environments and ecosystems. Adjustments can then be tested in advance so that the impact of improvements can be increased.

Take the city of Singapore for example. Singapore created an Internet of Digital Twins of the city, that can be researched, analysed and modified in real-time by multiple stakeholders from both public and private parties. By more efficient and accurate predictions of future experiences, Singapore can better anticipate the planning of

natural resources or provide services and contributing to a more sustainable quality of life. Singapore as a virtual city is a Public-Private Collaboration which enables the city to reinvent itself.

Another example is Sidewalk Toronto. This project combines the best in urban design with the latest technology to address some of the biggest challenges for cities; including energy usage, affordability of housing and transport. What does seem to be missing in the plan is the use of Digital Twins – a missed opportunity or an opportunity for Dutch businesses communities to take the leap?

It is necessary to enhance the learning capabilities and the adaptation of new technologies to remain future-proof as a company. Creation of a strategic alliance between real estate and technology is vital.

## 6. Energy & Learning

## 6.1. Built environment in school buildings in Prishtina and its correlation with student achievements in PISA testing in 2016: Case study school buildings in Prishtina

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### 6.1.1. Abstract

The first time Kosovo's participation to an international education valuation, the Programme for Educational Student Assessment (PISA), resulted with low ranking, confirming this way that the 15 year old students tested, didn't demonstrate and achieved the basic skills needed to be acquired by this age. On the other hand Kosovo's education facilities have been improved since 1999 with the help of international organisations, but there's still the lack of space and problems with sanitary facilities. With these problems representing the educational situation in nowadays Kosovo, the purpose of this study is to analyse the built environment of the schools, in terms of visual and thermal comfort. By analysing the physical environment of school buildings, this study will attempt to find out whether there is a correlation between built environment and student achievements.

The study will be based on the observation survey conducted at the sites based on international standard for Condition Survey NS 3424 and FM standard for categorisation of buildings NS 15221:4, which will result with categorisation of present elements of the buildings. The elements to be analyzed are the ones that have impact on teaching-learning comfort such as: windows, lighting, HVAC systems. The findings of the study will serve as basis for future improvements of the built environment and eventually development of Regulatory Data Bank that will serve to various stakeholders of education system in Kosovo. At the same time results of this research will serve as benchmark for comparison of similar situations in future, starting from this year since PISA test takes place every second year and it will be interesting to compare the results of 2016 and 2018 and see if our Problem Statement stands as true or not.

**Keywords:** Built environment, School buildings, Education, Student achievement

### 6.1.2. Introduction

Over the past 19 years, the educational system in Kosovo has been going through a lot of changes and reformation. It was facing a lot of challenges and obstacles due to the lack of adequate policies and decision-making in this sector as well as lack of professional mechanisms for the management of education system and quality assurance. This led to the current situation where Kosovo did not achieve desired standards in development, progress and stability in education system. The first time Kosovo's participation to an international education valuation, the Programme for Educational Student Assessment (PISA) on 2015, resulted with low ranking, confirming this way that the 15 year old students tested, didn't demonstrate and achieved the basic skills needed to be acquired by this age, in reading, mathematics and science, as compared to their peers coming from developing and developed countries that organise same test periodically.

Due to these difficulties that the Education System in Kosovo is facing for a long time we wanted to find out the impact that school buildings might have in students results by analyzing physical conditions of school buildings in Prishtina.

Describing built environment in school buildings in Prishtina by focusing on visual and thermal comfort, based on international standard for "CONDITION ASSESSMENT" NS 3424 we want to give a general information regarding the school buildings in Prishtina and try to find the impact that these conditions might have in students results.

### 6.1.3. Situation of School Buildings in Kosovo

The biggest challenges in Kosovo's education system are related to capacity and quality. In the period between 2005 and 2007, only 26 new schools were built. The opening of private institutions and construction, reconstruction and renovation of school building took place, but that didn't improve the situation. In 2008, Kosovo students learn in a less than two square meters per person space with the lack of proper equipment (laboratories), necessary for the learning process. The other main problem is that the learning process is held in two shifts, due to the lack of spaces in school buildings. (Unicef, 2008)

Another challenge for the education system in Kosovo is the enormous increase of urban migration from rural area. The number of students increased a lot in the capital city of Kosovo- Prishtina, meanwhile in other smaller cities and villages the number of students decreased a lot. This lead to a big number of students in classrooms of schools in Prishtina with an average of 30 students per class.

After the conflict in Kosovo, a lot of school building were destroyed either partially or entirely, with approximately 45 per cent of schools badly and 24 per cent moderately damaged. Almost all school lacked education materials like school furniture, textbooks, library books, science and laboratory equipment. (Unicef, 2004)<sup>16</sup>

Immediately after the conflict the focus of the donors was linked to rehabilitation and reconstruction of school buildings which later shifted to upgrading of facilities, especially water and sanitation installations.

#### Pisa and the result in Kosovo

PISA stand for Programme for International Student Assessment and represents the international education survey that valuates competencies of reading, mathematics and sciences in 15 year old students. It was established in 1997 and it is coordinated by the Organisation for Economic Co-operation and Development (OECD) and it takes part in large number of countries worldwide.

PISA tests the skills and knowledge of 15 year old students, in the key disciplines of reading, mathematics and science, but the 2015 assessment was focused particularly on science. It was the first time that Kosovo was included in this assessment with the total of 28 municipalities, 225 schools and 5,161 students.

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<sup>16</sup> [https://www.unicef.org/evaldatabase/files/Kosovo\\_2004\\_003\\_Child\\_Friendly\\_School.pdf](https://www.unicef.org/evaldatabase/files/Kosovo_2004_003_Child_Friendly_School.pdf)

The description of performance outcomes is described by proficiency levels. There are six proficiency levels used in each of three disciplines, while level 2 is defined as a baseline level of proficiency that students need to achieve to enable them to fully participate in society.

In Kosovo, only 32% of students perform at or above Level 2 in science. Students performing in Level 2 in science, demonstrate basic knowledge by being able to identify questions that can be investigated scientifically and can use basic scientific knowledge to identify a valid conclusion from a simple data set.

Only 23% of students in Kosovo achieve proficiency level 2 or above in reading. Student performing at Level 2 in reading, are able to locate one or more pieces of information in a text, recognize the main idea in the text, understanding relationships or construing meaning within a limited part of the text when the information is not prominent. They are able to make comparisons or contrasts based on a single feature in the text and can draw on personal experience and attitudes to make a comparison or connections between the text and external knowledge.

There are only 22% of students in Kosovo, that perform at or above Level 2 in mathematics, which means they are able to interpret and recognize situations in contexts that require more than direct inference. They can extract relevant informations from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers and are capable of making literal interpretations of the results, as well. (Ministry of Education, Science and Technology, 2016)

#### **Achievement Exam in Kosovo**

Achievement Exam organized by the Ministry of Education in Kosovo after the last semester of the 9th grade which is the last part of Primary School Studies. All the students of 9th grade need to take this exam in order to graduate and get the chance to continue High School Studies based on the results they get. Students are tested on the major subject and sciences, with the multiple structure of answers.

In 2016-2017 around 58% of students managed to pass the exam. Compared to the results in 2016-2017, this year 2017-2018 results were 3% higher, with the percentage of students passing the exam around 61%.<sup>17</sup>

#### **6.1.4. Theoretical background**

There is a strong relationship between school building conditions and students achievement.

As Hartenberger (2011) noted, Winston Churchill is reported to have said, "We shape our buildings; thereafter they shape us." However, trying to measure how our buildings influence their users is very difficult. Perhaps the reason is that the available data for researchers is variable and limited.

Educators and school board members must create best possible environment for the most productive learning of students. This implies that every student will be in a school building that will promote good learning. (Earthman, 2000)

The behavior of students is often driven by how they perceive their surroundings, including their physical environment (Maiden, Foreman, 1998)

A research completed by Edwards, Cash, Hines, Earthman, Van Berkum and Phillips explore the relationship between the variables of student achievement, behaviour and building conditions where was found the positive relationship between the condition of the school building and the achievement of students. (Earthman, 2000)

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<sup>17</sup> <http://www.ekonomiaonline.com/nacionale/shoqeri/shpallen-rezultatet-e-testit-te-arritshmerise-3-per-qind-mire-se-vitin-e-kaluar/>



In Kosovo there are some documents which highlight the importance of the building conditions on students achievements.

Kosovo Education Strategic Plan 2017 – 2021 has pointed out some objectives regarding the school buildings and infrastructure by building an effective system of education building management that contributes to the creation of suitable learning environments , developing norms and standards for the design of educational facilities for all levels. Norms and standards exist for level 1-9 and shall be developed for pre-school, vocational and higher education.

By organizing meetings in all regions including MEDs, Directorates of Urbanism, Design Offices, school directors, and monitoring the implementation of construction norms and standards it can lead to a better school management.<sup>18</sup>

Development plans are very important for school environment and its conditions. Ministry of Education according to this Strategic Plan should develop investment plans for school premises for 3 and 5 year time periods. Investment criteria shall be reviewed on an ongoing basis depending on the developments and achievements in the field of infrastructure. The improvement of educational infrastructure through construction, renovation, expansion and equipping of educational institutions with adequate teaching tools is one of the main objectives of Kosovo Education Strategic Plan 2017-2021.( MEST, 2016)

As we could see from the available information and sources Ministry of Education, Science and Technology in Kosovo , they have a standard they use for School facilities and norms" Design guidelines for School Facilities, norms and standards" .

On this publication there are specified details on building maintenance and conditions every building should meet in order to create a healthy environment for people wellbeing. One of the most important things stated on this document is the consideration of maintenance specialists on the design phases of the project, which is a totally new approach in Kosovo public sector.

The problem of physical facilities maintenance is a universal one and the consideration of this problem at design stage is of vital importance: in the early design stages of any building, it must be decided, in addition to the amount of space needed, the desired length of life for the building and the amount of money to be spent both in capital outlay and in maintenance. During the preparation of the design brief, decisions should be taken concerning capital expenditure in relation to annual repair and replacement costs as well as the ultimate building life to be expected. These decisions will have vital effects on the amount of maintenance the new buildings will require during their lifespan. It should be clearly understood that the lowest initial cost is usually not the most economical in the long run, as many cheaper materials will require more frequent maintenance and may have a shorter working life than some more adequate, but more expensive alternatives. The first place to prevent defects and reduce maintenance needs is in preparing a suitable initial design and, to achieve this, the maintenance system shall give more importance to the design of all new schools. The maintenance engineers and technicians should be consulted at each stage of the setting up of new constructions.<sup>19</sup>

Beside maintenance specialists, introduction of facility manager in each school or group of schools would be a great possibility to reduce costs, and use international practices and strategies toward a sustainable maintenance.

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18 [http://www.kryeministri-ks.net/repository/docs/KOSOVO\\_EDUCATION\\_STRATEGIC\\_PLAN.pdf](http://www.kryeministri-ks.net/repository/docs/KOSOVO_EDUCATION_STRATEGIC_PLAN.pdf)

19 <http://masht.rks-gov.net/uploads/2015/06/masht-vol1-eng-print-5mm-bleed-0mm-inside-final.pdf>

### **6.1.5. Purpose of the study, Methodology and Limitations**

#### **Purpose of the study and objectives**

The purpose of this study is to analyse the built environment of the school buildings, in terms of visual and thermal comfort, such as windows, lighting, HVAC systems and try to find if there is any correlation between the built environment and student achievements.

One of the main objective of this study is to point out the effect of some of the main conditions of school buildings in the learning process.

By describing and analyzing school buildings and students results and achievements we wanted to find out the impact that the physical conditions of the building might have in education system.

The hypothetical question that we want to give an answer is : - Does the built environment of school buildings in Prishtina affect the students achievement ?

#### **Methodology**

Due to the nature of research that we have focused on, our research approach is a mixture of Literature review, questionnaire, case study and interviews.

We have done a literature review, mainly publications of the Ministry of Science and Education of Kosovo, Municipality of Prishtina and other organisations that have interest on following the developments in the field of education in Kosovo. What we found is many statistical information on key figures when it comes to number and categorisation of students, number of school buildings, number of teachers, etc but we couldn't find any information or study that has been conducted on reasons that led to poor results at PISA test and other tests that are organised by Kosovo authorities

Since our professional and academic background is related to facilities management we wanted to find out if built environment is one of the reasons for the lack of success in learning process, consequently poor results in PISA test. In order to make professional assessment we have decided to conduct visits in the school buildings that we chose as our case studies. During those visits we have gathered data from the stakeholders and at the same time we have conducted visual observation of the conditions that those schools have, based on international standard for "CONDITION ASSESSMENT" NS 3424.

This standard provides 3 levels of assessment, Level 1 is the one we have done, which is Visual Observation, Level 2 is Concluding Casual Assessments, and Level 3 includes also laboratory tests of elements of the buildings if needed.

#### **Limitations**

The initial idea behind our study was to identify the schools in Prishtina which were subject to PISA testings and get the results from each school, so we could compare the results with the actual built environment and develop the case study. The PISA Governing Board representative of Kosovo that can share this confidential information and the OECD Division for Education informed us that "the information regarding schools is confidential and cannot be disclosed to the public". Any kind of confidentiality agreement or Memorandum of Understanding could not be signed, because of the lack of cooperation from the competent unit within the Ministry of Education. As a back-up plan, we came up with the idea to analyse schools in different regions of Kosovo, and compare the results with the overall PISA results for Kosovo.

While conducting this research we had several limitations that we have categorised into objective and subjective, and we have listed them below.

Due to the time constraint and lack of necessary resources we were not able to have sample size big enough in order to provide better understanding and correlation between the built environment and learning success of students at national level. However, what we did was concentration of the research in school buildings in Prishtina by carefully choosing school buildings that in a best way represent typology of school buildings at the

national level (Kosovo). If the sample could've been bigger also the results of the study could've been more accurate.

Other limitation was the lack of evidence (data) from the school managers on different aspects of school management. Therefore, we had to rely mainly on our research skills in order to obtain information needed to conduct this research.

Last part of limitations but not least important was the lack of information and cooperation from some of the school managers to provide information on school management. In our opinion this happened due to the existing setup where there's no clear division of responsibilities among the stakeholders on who is responsible for what when it comes to managing school facilities. You have to talk to several people in order to get one information. Hopefully with new strategy 2017-2021 this issue will be resolved.

#### **6.1.6. Case studies**

Besides general description, this chapter is consisted of detailed information about elements necessary for learning/ teaching process.

##### **Faik Konica School**



*Figure 1. Main entrance at Faik Konica school. (Photo: Illyria Press)*

Located in Prishtina city center, this school serves as elementary and low school (K9 school). It is built in 1954 and expanded with 2 annexes, which were built on 1999 and 2017. The total area of the school counts 6000 sqm and it has 45 toilets. It has an estimate of 1400 students, which work on two shifts, where the first shift starts at 08:00 AM and the second shift starts 01:00 PM.

The school was observed in order to identify the of elements responsible for providing comfort on teaching/ learning environment, such as windows, lighting systems, active systems for heating, ventilation and air conditioning. The observation was conducted along with the person responsible for the maintenance of the school building and areas around the school building. Except the observation form the survey, during the conversation with the responsible person, we identified some interesting details regarding the school and planning.

The school building lies in a flat area, surrounded by house and apartment buildings from one side and business companies on other side, such as bank, kindergarden, caffe shops. The pavement area around the school are combined with concrete cubes and asphalt. The outside area of the school is equipped with sport field such as football, basketball and tennis fields, but it lacks landscaping trees and grass fields.



*Figure 2. Outdoor sport area at Faik Konica school. (Photo: Albana Gjonbalaj, 2018)*

The object is connected to utilities such as water system, electrical system, sewage and district central heating. According to the observation conducted, the situation is as below.

The windows are consisted of two layered glass, with plastic frame. They are in fair condition, since in most of classes the windows are distorted and cannot close well. Even though present, the window shades are low quality.

The lighting strategy used in school is natural and artificial lighting. The artificial lighting is consisted of two rows of fluorescent lights, whereas there is no presence of sensors nor controllers of artificial lighting in the main building. The sensors and controllers are present in the new annex, which is not yet in function. There is no presence of light shelves.



*Figure 3. Actual condition of windows and shades in the classroom, Faik Konica school. (Photo: Albana Gjonbalaj, 2018)*

The school heating system is connected to the district central heating, and as backup uses its own heating system based on fuel. There is no presence of any air conditioning nor ventilation appliances thus school ventilation strategy is based on natural ventilation only.



Figure 4. Heating system at Faik Konica school. (Photo: Albana Gjonbalaj, 2018)

#### The Model School (Qamil Batalli)



Figure 5. Main entrance of The Model school. (Photo: Dardan Rexhepi 2016)

Located in north-eastern part of Prishtina, this school serves as elementary and low middle school. It was built in 2014, as there was an emergent need to release other schools in Prishtina from the large number of students and shifts. The school building has 5692 sqm in total and 730 students. This number of students allows the school management to work in only one shift, from 08:00 to 16:00.

The school was designed to serve as a model for other school buildings in Prishtina and Kosovo, just like its name says. Besides observation for elements responsible for providing comfort on the learning/teaching process such as windows, lighting systems, active systems for heating, ventilation and air conditioning, there were several other elements that made this school sustainable in terms of energy.

The school object lies in a flat area, while its surroundings are elevated from the surface for environmental and noise issues. It is located next to the neighbourhood's main street and railway, while it is surrounded by individual house buildings on one side and by an unused brick factory on the other side.





*Figure 6. Aerial photo of the school, depicting its location in relation to the residential houses, the main road and railway. (Photo, Google Earth 2018)*

Sport fields are paved with elastic materials, suitable for sport activities, while the surface around the building is paved with grass. The school has its own green roof, which serves for recreational and educational purposes.



*Figure 7. Atrium at the Model school. (Photo: Telegrafı )*

The object is connected to utilities such as water system, electrical system, sewage, while it's not connected to the district central heating.

According to the observation conducted, the situation is as below

The windows are consisted of Low-E two layered glass, with plastic frame. They are in a very good condition. Window shades are present as well and are of very good quality.

The lighting strategy used in school is natural and artificial lighting. The atrium ensures the maximum penetration of natural light in all the classrooms. The artificial lighting in classrooms is consisted of two rows of LED lights, whereas there is no presence of sensors nor controllers of artificial lighting. The light shelves are present in the classroom windows.



*Figure 8. The entrance hall at The Model School. (Photo: Urban)*



*Figure 9. Sport & Activities Area at the Model School (Photo: The Model School of Prishtina )*

The school is not connected to the central district heating, thus it has its own autonomous heating system, running on pelet. Active ventilation system is present in indoor sport areas, while there is no presence of any air conditioning nor ventilation appliances in classrooms or other areas at the school.



### Non-public School Don Bosco



*Figure 10. The main entrance of Don Bosko School, (Photo: Don Gecaj )*

Is one of the first non public schools that has been built in Kosovo immediately after the 1999 war. It was constructed in 2003 with financial aid by donors that mainly came from Italian government and other NGO-s coming from international community.

The school is situated in south-eastern part of Prishtina and it occupies 3ha of land and has a floor space of 10 000 m<sup>2</sup>. It can be accessed by public transport (7 min from city center) or by pedestrian routes (25 min walk from city center).

The school building is surrounded by other learning and administrative facilities such as: university buildings, administrative buildings (public utility companies), vocational training centres and individual house buildings, in a word it is an area with mixed typology of buildings and activities.

The interior of building consists of Vocational Training Center, Liceu, Gymnasium, Primary School, Youth Center and Library. Whereas, the rest includes spaces for social and cultural activities, such as Sports Center and green spaces for other activities.

The architecture of this building corresponds to contemporary standards in all 9 units of the compound. The floor is the same for all parts, except for bathrooms, laboratories and sports grounds. As for the interior, it is equipped with doors, windows, benches and chairs, as well as special office and lab furniture.

Apart from this, this facility has good electrical networking, Ventilation and Heating System (in some parts of the facility) and sanitary system (water and sewerage) in all of the premises. Doors of this school building have thermal insulation properties and are soundproof which has positive effect on teaching-learning process.

Windows are double glazed with vacuum inside which for the time of installation (2003) were best solution. With the time they are almost worn out and need to be replaced in the near future. So there is room for improvement in this aspect.

Floor of the building in corridors and classrooms is covered with marble, whereas in sanitary areas the floor is covered with ceramic tiles. The labs are covered with linoleum. Those materials are easy to maintain and are resistant to high traffic, such as in this school (750 students).

Lighting in this building is combination of natural and artificial light. Since the school works in one shift only natural light is doing most of the job. Artificial lighting consists of fluorescent light fixtures and partially in some areas also LED lights. In the aspect of lighting we can say that the school is quite sustainable.

Ventilation system in this school is combination of natural and mechanical. Classrooms have only natural ventilation, whereas mechanical systems are installed only in some areas, mainly labs.

Heating system in this building is composed of central heating plant and radiators that are spread to all facilities within the compound. The heating plant is run by diesel and electricity, therefore it is not the best solution nor economically or environmentally. However, it is achieving its purpose of creating thermal comfort for its users.

#### 6.1.7. Discussions

Standard EN NS 3424 provides 3 levels of assessment, Level 1 is the one we have done, which is Visual Observation, Level 2 is Concluding casual Assessments, and Level 3 includes also laboratory tests of elements of the buildings if needed.

By following instructions provided in this Standard NS 3424 we have done LEVEL 1 - Condition Survey and marked elements of the building based on our observation and managed to produce the average score for school buildings that we have surveyed. This result will be compared to the results that the same school have achieved during the last test organised by the MSE and also will compare it with national results that Kosovo has achieved with PISA test.

| School                  | Faik Konica | Shkolla Model | Don Bosco |
|-------------------------|-------------|---------------|-----------|
| Year                    | 1954        | 2014          | 2003      |
| Surface                 | 6000        | 5700          | 10 000    |
| Number of students      | 1400        | 730           | 746       |
| Shifts per day          | 2           | 1             | 1         |
| Number of toilets       | 45          |               |           |
| Windows                 | 2           | 1             | 1         |
| Shades                  | 2           | NI            | NI        |
| Soundproof              | NI          | 1             | 1         |
| Lighting strategy       | 1           | 1             | 1         |
| Light shelves           | NI          | 1             | 1         |
| Bulbs                   | 1           | 1             | 1         |
| Controllers and sensors | NI          | 2             | 2         |
| Heating                 | 1           | 1             | 2         |
| Ventilation             | 2           | 1             | 1         |
| Air conditioning        | NI          | NI            | NI        |
| ICT resources           | Yes         | Yes           | Yes       |

Table 1. Elements of the building that were assessed.

We have done evaluation of different elements and parts of the building that have direct impact on the internal comfort of the school, consequently on the teaching-learning process. The building elements that have been evaluated were initially summed up and after that were divided by number of elements that were evaluated and averages were produced. The figures that we have received from this exercise show to some extent the condition of the built environment in those premises. In our opinion those results should show some casual effect on results that those schools have achieved in PISA and the test organised by MSE.

| School name   | LEVEL 1 - Condition survey overall result<br>(based on standard EN NS 3424) |
|---------------|-----------------------------------------------------------------------------|
| Faik Konica   | 1.53                                                                        |
| Shkolla Model | 0.86                                                                        |
| Don Bosco     | 1.25                                                                        |

Table 2. Results of the evaluation/assessment based on Standard EN NS 3424.

The results that have obtained from the analysis of built environment based on Standard EN NS 3424 we have placed in the table below in order to make head-to-head comparison between the schools and also see how the score of built environment links with the average results that the same schools have achieved in tests organised by PISA and MSE.

| School Name   | LEVEL 1 - Condition Survey result (based on standard EN NS 3424) | Results of the average grade at the test organised by MSE (school year 2016-2017) | Results at the test organised by PISA (at the national level) |
|---------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------|
| Faik Konica   | 1.53                                                             | 3.98                                                                              | 32% Science<br><br>23% Reading<br><br>22% Mathematics         |
| Shkolla Model | 0.86                                                             | 4.21                                                                              |                                                               |
| Don Bosco     | 1.25                                                             | 4.5                                                                               |                                                               |

Table 3. Comparison of the results of built environment and test results/achievement.

As noted from the results above there's some relation between the score of Condition Survey and results achieved in the test organised by MSE. Schools that reached lower score in Condition Survey (buildings with minor non-conformities) tend to achieve better results in tests organised by MSE.

In following text we have provided more info about the school buildings that we have assessed.

### Faik Konica school

There is a perception that the Faik Konica school is one of the best schools in Prishtina. However, the building itself needs a lot of school equipment and elements to be installed in order to provide full comfort for its students. Having into consideration that the building itself is in the city center, surrounded by different

commercial and residential buildings, the school lacks soundproofing windows. There is no presence of artificial lighting sensors and controllers, which in conditions of two shifts schedule can result in inability to identify the proper time of artificial lighting activation. The absence of air conditioning and ventilation systems, low quality of window shades and the presence of glare, lead to very high and uncomfortable temperature in classrooms, which in most cases can result in student lack of concentration.

### **Model School**

The Model School of Prishtina is identified as one of the buildings with the best physical conditions. Even that it is located on the main street of the neighbourhood due to the windows that are consisted of Low-E two layered glass the noise is not a problem for the students of this school compared to Faik Konica School. The plan and form of the building itself, adding the facilities and infrastructure indicate that the Model School is one of the most efficient buildings in Kosovo.

### **Non Public school Don Bosco**

As conclusion for this school we can say that currently provides internal comfort for its users but this comfort will diminish soon and the supervisory board of the school needs to think on investing in improvement of insulation (replace the building envelope, including windows), as well as investing in equipment that enable production of renewable energy on-site such as: heat pumps, solar and PV panels, etc.

## **6.1.8. Conclusions and Recommendations**

### **Conclusions**

Based on the study that we have done existing school buildings in Prishtina need to be refurbished and upgraded at the level that is needed to become sustainable and at the same time serve the purpose of fulfilling the needs of the occupants for normal school process.

There is a strong need for giving the efficiency approach to these buildings since most of them do not meet even the lowest criteria of efficient buildings.

Lack of space in school buildings makes the learning process difficult leading to high number of students in classrooms and work in two shifts. Three buildings used as representative cases of the schools in Prishtina lack either noise reduction elements, HVAC or proper shading. This results in added amounts of noise in school buildings, uncontrollable levels of temperature, humidity, air quality and ventilation and could cause problems that impact the teaching/ learning process, such as bacteria growth, tiredness of teachers and pupils, decreasing this way their effectiveness in the whole process. Natural ventilation in the classrooms can enable the entry of polluted air and leakage of warm air, causing energy loss.

Documents and Policies regarding Schools Development Plan in Kosovo exist and specify the importance of the built environment and its maintenance but it is difficult to apply all the steps needed for the improvement of situation since as mentioned on "Design guidelines for School Facilities, norms and standards" - the maintenance specialist must be included since the designing phases of the building, meanwhile most of the school buildings in Prishtina are very old and were not designated for this capacity of students.

### **Recommendations**

As known, primary function of the education system in every society is to provide adequate level of education in order to have scientifically literate citizens. In order to accomplish this objective resources are needed (financial, intellectual, etc) that would energize the system. Therefore, there should be good communication and coordination of activities among the stakeholders in education system because it will ensure that the objective is achieved by using limited resources at hand in a more reasonable manner.

As noted in our research, existing situation of education system in Kosovo is not good, and it needs urgent attention of stakeholders in order to treat the most acute problems that relate partially to built environment as well. From this perspective we can recommend certain measures that would help improve existing situation.

**Systemic reform in the field of education:** needs to be undertaken in order to better underline the responsibilities that stakeholders have when it comes to school management. At this stage what is known is that all capital investments (building and renovation) is responsibility of central government, whereas day to day management (including facilities management) is responsibility of local government (municipalities). The problem starts at this point where the school management is done by the school director which in most of the cases doesn't have necessary skills and abilities to manage the built environment. The best solution would be division of responsibilities in school buildings in Academic part that would be managed by school director and Infrastructure part that would be managed by Facilities Manager. Therefore, first recommendation leads to the second recommendation, which is

**Introduction of Facilities Managers in the school buildings** that would have professional background in managing school buildings. Depending from the size of school buildings and their vicinity Facility Manager would be responsible to manage one school or a group of schools. This division of responsibilities among the stakeholders would enable school directors deal with its core responsibilities which is education of youth, whereas Facility managers would deal with non-core ones. As known the profession of facility manager in Kosovo is rather new thing, there will be a need to train/educate staff in this aspect. There are institutions of higher education that provide education for Facility Managers (ESLG is one of them). At national level respective training providers should be encouraged to develop training capacity that can meet the demand of municipalities and schools for training in this field. Municipalities, and where appropriate the central level, would bear responsibility for implementation of training programmes, whereas MEST should oversee the training process.

**Introduction of Condition Surveys for School Buildings** that would serve as tool for evaluating school facilities in national level. The survey would also serve as a document that provides general information about facilities, describe potential problematic areas and provide financial and maintenance planning.

**Investing on energy efficiency measures in school buildings** would be another recommendation for MSE at the national level. Improvement of building envelopes, improvement of lighting, improvement of thermal comfort would inevitable improve the learning environment, consequently preconditions for better learning process would've been created.

**Comprehensive study of the built environment in school buildings** is needed in order to determine needs: for investments on sustainability in existing school buildings (renovations), add school buildings as needed in order to cope with increasing density of population in urban areas, re-assess the usability of school buildings in rural areas where we have poor utilisation of space.

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#### 6.1.10. Annex

##### Questionnaire

##### Introduction to survey

This condition survey is designed to assess the condition of elements of school buildings in Kosovo responsible for providing comfort on teaching/learning environment. These elements are windows, lighting, active systems for heating, ventilation and air conditioning.

The condition survey will be conducted by a team of professionals helped by maintenance personnel working on schools.

This condition survey will be based on observations conducted in school sites and will be based on Norwegian standard on condition survey NS 3424 and facilities management standard for categorization of buildings NS15221:4. Based on the NS3424, the condition degrees are as below:

- 0 - No nonconformities
- 1 - Small nonconformities
- 2 - Essential nonconformities
- 3 - Serious nonconformities

##### 1. Basic information

1. School name \_\_\_\_\_
2. Location \_\_\_\_\_
3. Year \_\_\_\_\_
4. Surface sqm \_\_\_\_\_

##### 2. Windows and accompanying elements

- 2.1 Windows \_\_\_\_\_
- Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
- 2.2 Shades \_\_\_\_\_
- Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3

### 2.3 Additional information

---

#### 3. Lighting (daylight and electric light)

1. Lighting strategy \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
  2. Light shelves \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
  3. Bulbs \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
  4. Controllers \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
  5. Additional information \_\_\_\_\_
- 

#### 4. Active systems for heating, ventilation and air conditioning

- 4.1 Heating \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
- 4.2 Ventilation \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3
- 4.3 Air conditioning \_\_\_\_\_  
 Condition ☐ 0 ☐ 1 ☐ 2 ☐ 3



## 6.2. The cost effect of sustainable climate installations in commercial real estate: an illusion?

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### 6.2.1. Abstract

Reducing user costs is an important factor for tenants of commercial real estate in choosing sustainable objects. Various studies in the commercial real estate sector indeed emphasizes costs effects by structural energy savings. However, for a transparent conclusion on the cost effects of sustainable real estate a broader point of view is necessary. Dutch tenants for example are responsible for paying the maintenance costs of climate installations as well. Understanding these broader cost saving effects improves insights into the real benefits of sustainable investments in general. In this paper we examine the maintenance cost of climate installations in commercial real estate in relation to the energy label. We do so by using a database of the climate installations and maintenance costs of Dutch commercial real estate assets. Our findings show that the maintenance costs of sustainable climate installations of commercial real estate in the Netherlands are negative correlated with the energy label. Moreover: the less sustainable the energy label, the lower the maintenance costs of climate installations are. Between a B label and the lowest G label there is a difference of € 1.300,- for maintenance per year. These findings undermine the illusion of the cost benefits for tenants of commercial real estate in the Netherlands.

**Keywords:** Sustainability, Commercial, Real estate, Climate installations

### 6.2.2. Literature

Recent market outlook in commercial real estate markets have shown that the trend of sustainability in commercial real estate has a structural character, both for real estate owners as well as for tenants. The literature on this topic confirms both strategies by emphasizing the positive effects of sustainable investments. Much research is devoted from the real estate owner perspective, most focused particularly on offices. Eichholtz et al. (2010), Kok & Jennen (2012), ..... show that sustainable buildings command a significant increase of rents and selling prices than otherwise identical buildings. Concerning tenants who are doing green, studies find significant cost benefits of sustainable real estate (Majcen & Itard, 2014; .....).

The existing literature however, lacks an evidence based analysis of the long term perspective of the exploitation costs. Although there is a growing attention for *Total Cost of Ownership* and the *Life Cycle Costs*, (Cole & Sterner, 2000; Aye et al., 2010) the maintenance costs of the climate installations is only little studied. Understanding these effects improves our insight into the user costs of sustainability; in the Netherlands tenants of commercial real estate have to pay the costs of maintaining the climate installations.

The Green Building Council Australia (2008: p. 15) emphasizes that a sustainable office reduces the 'operating costs' with 8-9 percent. Although an exact conceptualising of these operation costs is not incorporated, it can likely be suggested these imply the maintenance costs. Three other Dutch studies suggest a negative correlation however. Following Scherrenberg (2015) the maintenance costs of more sustainable climate installations are more expensive due to the complexity of these installations. Therefore a) higher educated employee are necessary as well as b) the costs of new parts are relatively higher. Menkveld (2016: p.2) confirms this complexity, by showing that the climate installations often are not optimally adjusted. Menkveld (2016) mentions this results in 30% higher energy costs than what should technically be feasible. In a research setting similar to ours a recent study of the Energy research Centre Netherland (ECN) and Statistics Netherlands (CBS) (ECN & CBS, 2017) was the first to present a negative correlation between the energy label and the maintenance costs of climate installations. An office with the highest energy level A of about 4.320 square meter is in average yearly € 700,00 more expensive for the maintenance costs of climate installations compared to a similar office with an energy label of G. ECN & CBS address this might be due to a higher intensity of use. A conclusion that also is suggested in the Office Service Charge Analysis Report 2012 by Jones Lang Lasalle (2012).

Concerning the selected dataset it seems probable that the existing Dutch literature is most relevant. Therefore the hypothesis of this research states that the current assumptions of the user costs create a significant underestimation of the maintenance costs of installations of commercial real estate ultimo 2017. Following upon this we define this as a so called technical rebound effect. This is narrowly related to the general rebound effect as is presented by authors in the residential sector. Different studies (e.g. Branco, 2004; Guerra Santin, 2010; Visscher et al., 2016) suggest that the theoretical energy use often is to overestimated when for average and less energy efficient dwellings and underestimated for new or retrofitted buildings. This phenomenon can partly be explained by the rebound effect: lower costs of energy encourage in this way an increased consumption. The so-called technical rebound effect implies that more energy efficient technologies lower the costs for the energy but increase the total costs for a tenant of commercial real estate due to higher maintenance costs for climate installations.

The research on this causality will lead to more insights into sustainability investments. Besides the 'long-term prudent and economical use', the 'long-term affordability in its broadest sense' will serve as an elementary variable in order to arrive to a fully representative image for valid and reliable sustainability investment decisions.

### 6.2.3. Variables

This research focuses on the building-specific variables that may affect the maintenance cost of installations in commercial real estate in the Netherlands. According to [www.exploitatiekosten.com](http://www.exploitatiekosten.com) maintenance costs are highly dependent on the – intensity of the – function of use, such as a school or an office. Consequently the variable **function of use** has been included in this research.

The energy consumption appears to be depending on the variable construction period. This is due to differences in isolations value, which correlate with different regulation in specific construction periods. Likewise does

www.liberoaankoop.nl confirm the correlation between the energy use and the construction period. They explain this correlation by poorly insulated houses from before 1920 due to the lack of legislation and demand pressure. The energy use of these houses is often relatively high. The introduction of generally applicable building standards, quality and regulations of the national building degree has led to increased quality since 1990, as a result of the use of low-maintenance building materials and lower heating costs. Scherrenberg (2015) also implicitly refers to a relationship with the construction period, as he speaks of maintenance costs of modern installations of commercial real estate, which are significantly more expensive due to the increase in complexity. In line with this relationship, does the floor area appear to be a relevant factor for the maintenance costs of climate installations. Almost all costs depend on the size of an object: construction costs, rental costs, purchase costs and also energy consumption, according to research by NIBUD (2009). Furthermore, Opschoor (2011) states that climate installations are becoming more and more energy-efficient, but simultaneously also more complex. This may implicitly point to the construction period, similar as to the 'modern installations' of Scherrenberg (2015) and ECN & CBS (2017). However, it can also implicitly say something about the variable type of climate installation. Finally, www.energieverbruikberekenen.com indicates that a house with an energy label A is better isolated than a house with a lower energy label. In addition, a house with an energy label A makes more efficient use of (residual) heat, resulting in lower energy consumption. In this way, the energy label is also examined in relation to the maintenance costs of climate installations.

Table 1 provides an overview of the selected independently tested variables in relation to the maintenance costs of climate installations for commercial real estate in the Netherlands with an energy label.

*Table 1. Variables used in the regression model*

| Independent Variable                                      | Hypothesis                                                            | Source                                                                  | Data source |
|-----------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------|-------------|
| Function of Use                                           | The maintenance costs differ per function of use                      | Exploitatiekosten.com                                                   | RVO         |
| Construction Period                                       | The more recent the construction period, the higher the energy costs  | Energieverbruikberekenen.com<br>Liberoaankoop.nl<br>Scherrenberg (2015) | RVO         |
| Floor Area                                                | The larger the floor area, the higher the maintenance costs           | Nibud (2009)                                                            | RVO         |
| Type of Climate Installation<br>(both heating as cooling) | The maintenance costs differ per type of climate installation         | Opschoor (2011)<br>Scherrenberg (2015)                                  | RVO         |
| Energy label                                              | The more favourable the energy label, the lower the maintenance costs | Energieverbruikberekenen.com                                            | RVO         |

*Source: Own processing (2017)*

#### **6.2.4. Dataset**

This research focuses on the maintenance costs of the building-related, mechanical installations in commercial real estate in the Netherlands. The replacement and consumption costs are not taken into account. These costs are highly dependent on the individual (function of) use and would lead to a high level of assumptions, which would obscure an objective comparison.

For maintenance costs, a dataset provided by the Netherlands Enterprise Agency (RVO), part of the Ministry of Economic Affairs, is used. RVO verifies whether parties comply to the obligation to have an energy label for commercial property at the time of the transaction. The time of the transaction in this case is the delivery, sale or rental of objects. In order to arrive at a valid energy label, the type of climate installation must also be reported

(E. Hulsker, personal communication, 13 December 2016). The data is verified on the spot. The input data of all advisers from 17 July 2012 to 16 September 2016 are collected in the obtained and used dataset for this research. The dataset is a predominantly numeric excel file with 1112 objects. Index prices of maintenance costs for climate installations are linked to this dataset provided by the RVO.

There have been amendments to the data at two points. First concerning the heating types, of which the choice for district heating is not present. After checking the 'other heating types' category, 130 observations with a fixed generation yield of 1 appear. According to NEN 7120 this applies to external heating supply ([www.rvo.nl](http://www.rvo.nl)), namely district heating. The remaining 107 observations concerning 'other heating types' have been left out of consideration, since no heating type can be linked. Second, there is no possibility to indicate the heating type 'WKO' in this category. In the entire raw data set there are 10 observations stating 'cold storage'. In two cases there is a combination of 'cold storage' with district heating and in the other eight cases there is a combination of 'cold storage' with an 'electrical installation'. Both combinations are representative for absorbing peak load and could serve as a back-up for an WKO installation according to the three experts, indicating that 'cold storage' must be interpreted as WKO. This interpretation results in the conversion of these 10 observations to the heating type 'WKO'. With regard to the maintenance costs, the other types of heating providing for the peak load and serving as back-up also count, since these installations also require maintenance.

After processing 1005 observations, the dataset contains the following variables:

- Label class;
- Construction year;
- Usage function;
- Floor area;
- Year of renovation;
- Cooling type;
- Maintenance costs cooling;
- Heating type;
- Maintenance costs heating;
- Maintenance costs cooling + heating.

Using this dataset, the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label will be tested for possible significant correlations by means of hypotheses. These hypotheses have been drawn up on the basis of the theoretical framework and are tested using pivot tables, followed by static analyses using the statistics program Stata. These analyses can be used to determine whether it has an influence for each factor, and so, how great this influence is on the maintenance costs of climate installations for commercial real estate in the Netherlands with an energy label. A distinction must be made between the explanatory variables and the variables to be explained. The explained variables, also called dependent variables, are in this case the maintenance costs of climate installations (on the basis of indices) of commercial real estate in the Netherlands with an energy label. The factors in this study are the explanatory variables, also known as independent variables, which make it possible to make a statement about the variable to be explained, the maintenance costs of climate installations for commercial real estate in the Netherlands with an energy label. While there is a distinction between, on the one hand the dependent variable, the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label, and on the other hand the independent variables, the various factors, an asymmetrical analytic method is necessary. A regression analysis is eligible since it could reveal the extent to which the explanatory variables explain the variance of the maintenance costs of climate installations for commercial real estate in the Netherlands with an energy label, with a confidence interval of 95%. This is done in most cases by means of a single regression and in a single case with a multiple regression. The mathematical notation of these analyses is:

Single regression:  $y = bx + c$

Multiple regression:  $y = ax + bx + c$

Here the dependent variable is denote 'y'. 'a' and 'b' are equal to the intercept and regression slope, x is the independent variable – the predictor – and 'c' is a constant (Marquard & Ronteltap, 2015).

Before proceeding with the regression analyses, it is tested whether the variables in the dataset agree with the assumptions. Instead of using years of construction, a dummy variable was created with construction periods in order to make a relevant estimate of the construction quality. Moreover, the possibility for multi-collinearity is tested. The results are showed in the correlation matrix (Figure 1).

*Figure 1 Correlation matrix*

```
. spearman LABELKLASSE  GEBRUIKSFUNCTIE EFFECTIEVE_OPPERVLAKTE KOELING_TYPE VERWARMING_TYPE bouwperiode
(obs=1005)
```

|              | LABELK~E | GEBRUI~E | EFFECT~E | KOELIN~E | VERWAR~E | bouwpe~e |
|--------------|----------|----------|----------|----------|----------|----------|
| LABELKLASSE  | 1.0000   |          |          |          |          |          |
| GEBRUIKSFU~E | -0.1854  | 1.0000   |          |          |          |          |
| EFFECTIEVE~E | -0.0106  | -0.1686  | 1.0000   |          |          |          |
| KOELING_TYPE | -0.2338  | 0.0980   | 0.1190   | 1.0000   |          |          |
| VERWARMING~E | 0.3294   | -0.2196  | -0.0250  | -0.3448  | 1.0000   |          |
| bouwperiode  | -0.5915  | 0.1307   | 0.0517   | 0.2696   | -0.3639  | 1.0000   |

*Source: Own processing (2017)*

Since the correlations are relatively small, the chance of multi-collinearity can be excluded. Van der Meer (2017) provides a complete elaboration of all analyses and a logbook of the variables.

### 6.2.5. Results

All hypotheses have been adopted. This means that on the basis of the simple regressions, there is a significant relationship between the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label and:

- The use function;
- The construction period;
- The floor area;
- The type of climate installation;
- The energy label.

Through the integral analysis, the significant correlation between the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label holds for:

- The use function, specific on the use function of education;
- The construction period, all construction periods, with the exception of construction period 4, being 1998 to 1999 at the time of the first tightening by the EPC.
- The floor area;
- The type of climate installation, specific on the cooling types.

It should be noted that a distinction can be observed in the size of the aforementioned links. In addition, a number of links show contraire results to what could be expected on the basis of existing literature.

The research results show that the increase in maintenance costs of modern climate installations of commercial real estate with an energy label only applies for commercial real estate up to the construction year of 2002. Furthermore, it is striking that the maintenance costs of climate installations of commercial real estate with a construction year from 2011 onwards, are almost comparable the ones dating from before 1992. In other words; the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label

constructed between 1992 and 2010 are generally higher than commercial real estate build before and after this construction period. A tightening of the EPC took place twice during this construction period. Despite, the maintenance costs of climate installations have increased significantly during this construction period. There is an average increase in the annual maintenance costs of climate installations of roughly € 1,700.00 compared to both periods before and after. The statement that maintenance costs of modern installations of commercial real estate are higher, therefore does not hold for climate installations for commercial real estate in the Netherlands with an energy label. This can be explained by the fact that these installations have been modernized with no, or to limited, extent to maintenance costs. As an example; the central heating boiler has been modernized over time in terms of improved efficiency. In terms of consumption will the HR 107 central heating boiler be the most economical, however the maintenance costs of all types of central heating boilers will stay comparable.

The correlation between label and construction period is very high (just under 0.6). The coefficients are therefore difficult to interpret. In terms of content, it could be true that in recent constructions, because of relatively good insulation fewer installations will be needed. This is clearly different for buildings concerning earlier years of construction that are being renovated. It is clear that more recent buildings usually have a higher label and construction periods from 2012 onward, have significantly higher maintenance costs compared to almost all other periods.

Furthermore, it appears that a disproportionate distribution of climate installations in relation to the different functions of use, is visible. This is in line with the expectation from the literature, stating that the maintenance costs of climate installations differ per use function. A significant statistical relationship has been demonstrated between the maintenance costs of climate installations for commercial real estate in the Netherlands with an energy label and the use function. To conclude, on the basis of the dataset, the maintenance costs for climate installations of the commercial real estate in the Netherlands with an energy label, is the highest for office and education use functions and the lowest for a shop usage function.

With regard to the variable 'floor area', it appears that there is a significant relation with the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label and the floor area. Not less than 96.85% of the total variance of the maintenance costs of the air conditioning installations (heating and cooling) can be explained on the basis of the assumed relationship with the floor area. This is much higher than expected. It seemed more logical that the type of climate installation would have a very large influence on its maintenance costs, but it shows that the floor area largely determines the maintenance costs of the climate installations. This can be explained by the fact that the number of installations or the size of their capacity have a major influence on the level of maintenance costs. The number of climate installations depends on the total power required and the power required depends in turn, on the floor area. The analysis shows that if the floor area rises by 1 square meter, the annual maintenance costs of the climate installations of commercial real estate in the Netherlands with an energy label increase by € 0.89 per square meter, with a constant of € 480.55. Although the maintenance costs of climate installations increase as the floor area increases, these costs decrease on average per square meter as the floor area rises.

The maintenance costs differ significantly per climate installation. Maintenance costs of climate installations vary from approximately € 25.00 per year for an electrical installation to approximately €4,500.00 per year for cold storage, among also other combinations. Although the statistical analysis confirms the expectation that there are differences in the maintenance costs based on the type of climate installation, it is striking that the relationship is less significant than logically expected. The explanation could lie in difference in the relationship between the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label and the corresponding floor area, which is relatively greater, and the relationship between the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label and the existing climate installations present.

What strikes out concerning the variable 'energy label', looking at the single regression starting from energy label B, is the contraire results in terms of the expectation. Based on this study, there is a negative causal relationship found between the maintenance costs of climate installations of commercial real estate in the Netherlands with an energy label and the type of energy label. In other words: the less favourable the energy label (from energy

label B), the lower the annual maintenance costs of the climate installations. Between energy label B and energy label G there is approximately € 1,300.00 difference per year, solely for the maintenance costs of the climate installations. According to Jones Lang LaSalle (2012), this can be explained by the fact that offices with a high energy label (energy label A to C) are often used more intensively. Considered the work concept 'The New Way of Working' and the often higher service level present.

The differences between the actual and the expected energy use have to be taken seriously and will have to be adopted better in the policies. As for now the theoretical expected savings do not match reality and will lead to disappointments and in the end unfeasible renovation projects. The energy savings will mostly not be enough to cover the investments. When a house is renovated the comfort level increases which is mostly not taken into account. A more holistic approach towards housing renovations seems necessary

#### **6.2.6. Recommendations**

The results of this research provide a striking overview of the cost effects of sustainability. The owner can still achieve the, by return driven, desired results, on the basis of higher retrieved rents when investing in sustainability. On the contrary is the user, on the basis of reputation and the given expectations of lower consumption costs, in reality financially duped. Clearly these differences in actual and expected costs of sustainable tenants have to be taken seriously. Higher rents for properties with a high energy labels cannot be justified on the basis of these data, on the grounds of lower user costs. From the social point of view on sustainable value, otherwise a suboptimal situation will be established. An inconvenient truth.

In order to be able to continue the sustainability challenge from the conditions of social value, a more holistic as well as balanced distribution of burdens and benefits is necessary. This is possible by allowing each actor to be responsible for themselves, without looking or waiting for others (cf. Coase, 1937). It is precisely the quantitative transparency created in this research that can contribute to this cause - inspiration can be derived from the Nash equilibrium. A promising institutional solution to the problem seems to be a combination of the existing energy label system and the BREAAAM method, which is based on an assessment of the responsibility between the owner and the user. If one of the parties does not comply, for whatever reason, the certification is at stake - at any time. This leads to a fundamental trigger for 'doing well'.

The results therefore simultaneously show the shortcoming in the existing system of energy labels. On the basis of this study, a label entirely tailored to i) the owner and ii) the users, seems to be the only way to effectively manage the transition to a more sustainable world. Moreover, this separation makes it possible to integrate with the WELL building components - with regard to productivity and wellbeing of employees - whereby the relationship and responsibility between building/asset and user are integrated. The real time possibilities that data collection in office buildings already offers, will make a relevant contribution to this.

It still happens too often that a developer and/or contractor is responsible for supplying an energy efficient building, while the results are ultimately determined by the manner of use. This is a potential moral hazard – which something also applies to the investor to a certain extent. Although an all-in rent can offer a wrong incentive, it can trigger a change in the behaviour of the investor. The user effect seems at least as relevant for (social) rental housing. Further research into the behavioural aspect in this context seems important.

In addition, solutions could also be found in, for example, an ESCO, where a third party takes responsibility for the energy usage through performance contracts. From this perspective, a trigger for producers of climate systems to achieve more efficient products in the long term is also justified.

Integration of these components can lead to actual sustainability and thus provide a driver for further investments in social value. In short, insight leads to opportunities.

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### **6.3. Buildings' energy consumption forecasting – a model based on general regression neural network**

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#### **6.3.1. Abstract**

The energy consumption of buildings has an impact on the environment, and also influences the economic and social needs of the buildings' users. Thus, energy consumption forecasting is important, particularly during the optimal building design selection. That is a complex and responsible process which depends on numerous and time-changeable factors. Thus, it is helpful to have a model for buildings' energy consumption forecasting. This paper presents such a model using historical data for real energy consumption of 55 buildings built in R. Macedonia. Data were used as an input in DTREG software. The model was built by application of General regression neural network. The prediction of the target variable – building' energy consumption was very accurate, considering that the data are real (the model' mean absolute percentage error – MAPE is 3.12 %, and the coefficient R<sup>2</sup> which gives the global fit of the model, i.e. the coefficient of determination, is 91.70%). The coefficient of correlation between actual and predicted target values is 0.969. The general conclusion is that forecasting models for energy consumption of the buildings are a useful tool for all project participants and should be used as a support in the process of building' design selection.

**Keywords:** Building, Energy usage, Forecasting, General regression neural network

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### 6.3.2. Introduction

Buildings, as other construction projects, support the economic development of the countries, but they have an impact on the environment and, also on the economic and social needs of the building' users (Yedra, et al. 2014; Amber, et al. 2017). At the same time, buildings are one of the biggest consumers of energy (Hsueh, Yan, 2011; Farhat, et al. 2014; Zalejska-Jonsson, 2014). Thus, buildings' energy performances and energy usage have a great potential for improvement in order to decrease the global energy consumption (Jones, et al. 2013; Robinson, et al. 2016; Thyer, et al. 2018). That is applicable not only for new buildings, but also for existing buildings during their operation (Stevenson, Leaman, 2010; Jones et al. 2013). In that relation, for driving innovations in energy efficiency in the building sector, particularly important are public policies of different domains and levels (Kivimaa, 2018). Hence, in the R. Macedonia the buildings energy consumption is covered by several laws and Rulebooks regarding construction of facilities, energy efficiency, protection of the environment, etc. (such as: Rulebook on standards and norms for designing, 2012; Law on construction, 2013; Rulebook on energy characteristics of buildings, 2013).

As stated by Farhat et al. (2014) the initial stage in reducing the building' energy usage is effective design of the building. There, an important role is played by the knowledge for the building' design effect, efficiency of the equipment, buildings' maintenance (Thyer, 2018) energy specific consumption index (Jota, et al. 2017), energy related cost etc. Additionally, there are numerous solutions that can be used for energy reduction of the buildings, such as: using Building Information Modeling – BIM for selection of the best solution from the aspect of energy consumption (Wong, Fan, 2013), usage of the system with ground source heat pump (Michopoulos, et al. 2016), using double glazed windows, choosing solutions with renewable energy systems (Farhat, et al. 2014), combination of systems for cooling, power and heating (Rasool, et al. 2015; Kialashaki, 2018), installation of system for energy management (Farhat, et al. 2014; Rasool, et al. 2015), etc. Also, historical data and experiences from previous energy usage of buildings are pointed as useful for improving the buildings' energy consumption (Gu, et al. 2012). Therefore, Diakaki et al. (2010) stated that for choosing the measures for buildings' energy savings it is important to use multi-objective model that evaluates the alternatives using a set of criteria.

There are numerous studies regarding buildings energy consumption from different aspects and using different methods and technics (Mang, Reed, 2012; McMahon, 2012). Techniques vary from simple techniques, such as simple regression, to techniques that are complex and are based on physical principles. For all those models the suggestion is for the input data to be real, in order to get better accuracy of the energy consumption prediction (Neto, Fiorelli, 2008). For example, Amber et al. (2017) used sets of five years real data for university buildings to develop a forecasting model using the Multiple Regression technique. As explanatory variables they used: building type, solar radiation, wind speed, ambient temperature, weekday index and relative humidity.

The widely used methods for forecasting building' energy usages are the traditional numerical and statistical methods, although they are not accurate and suitable in many cases, due to energy consumption dependence on many parameters. Therefore, intelligent methods, particularly artificial neural networks (ANNs) are also used for energy prediction of buildings (Kalogirou, 2009). In many cases they gave more accurate prediction compared to the traditional methods (Kalogirou, 2009; Kumar, et al. 2013; Vakili, et al. 2015).

For energy prediction of buildings ANNs were used by Kumar, et al. (2013) and also by Gonzales and Zamarreno (2005). Similarly, Dong et al. (2018) used ANNs for prediction of energy consumption and related cost for office buildings constructed of cross laminated timber, using 11 input variables including construction variables and building form. For selecting the training datasets for the ANN training, Latin hypercube sampling (LHS) method was used. They have obtained the best ANN by analyzing the number of hidden layers and the output variables and ANN with multiple outputs has presented better prediction than the ANN with single output. Also their results have shown that predicting building energy and consumption and cost with ANN was 80% shorter than the traditional calculation methods.

Another study that uses ANN for predicting the building' consumption of energy is the study of Neto and Fiorelli (2008). They compared a simple ANN model with the model based on physical principles. The investigation results pointed out that both techniques are suitable for modeling the energy consumption.

Ekici and Aksoy (2009) used backpropagation neural network for forecasting the energy needs of buildings (using: orientation, insulation thickness and transparency ratio as variables). It was shown that modeling with ANN gave satisfactory forecasting results.

Arida et al. (2016) used non-linear auto-regression ANN for modeling methods for energy-system of building. As input variables they used: type of days, hours of day, wet-bulb and dry-bulb outdoor air temperatures. It was shown that the energy consumptions can be accurately predicted using the proposed model.

Building energy usage depends on weather conditions, so for energy prediction of building Holcomb et al. (2009) used data for buildings that had similar structure and that were built in the buildings' neighborhood (due to similar weather conditions). Parameters considered in the model were: air temperature of heating and cooling, maximum and minimum temperature allowed by control, lighting, internal walls locations, ceiling heights, density of people, the thickness of fiberglass insulation for roof and external walls, solar absorbance of roof and window thickness. The data were elaborated using: support vector regression (SVR), ANN and multilinear regression. Using EnergyPlus, the results of a simulation had shown the promise of the proposed methods.

Ahmad et al. (2014) reviewed the widely used methods that gave satisfactory accuracy for predicting building electrical energy: artificial neural networks and support vector machine. They stated that for more accurate predicting the hybridization of these methods could be applied.

The comparison of different ANNs made by Li et al. (2017) revealed that accurate prediction of building' energy consumption can be obtained using an extreme deep learning approach that combines extreme learning machine with stacked autoencoders. The partial autocorrelation analysis method was used for determination of the input variables for the extreme deep learning model. Furthermore, the approach has been compared with support vector regression, backward propagation neural network and multiple linear regression. It was shown that authors' extreme deep learning approach gave the best prediction results in different cases for prediction of building energy consumption.

Regarding the above discussed, it can be said that prediction of building energy consumption is necessary for improving the energy utilization rate. Thus, there are investigations in numerous directions connected with buildings energy usage. Also, additional studies are needed in order to achieve building' design with better performances (Jawdeh, et al. 2010). One of the directions for investigation is buildings' energy usage forecasting. It is a complex and effortful process, but such a model is important as a support tool for the building' optimal design selection. It helps building designers and managers during the building decisions making processes, although accurate prediction of the building energy consumption is not an easy task to realize. Due to that, the aim of this paper is to develop a model for building energy consumption forecasting using intelligent forecasting technique – General regression neural network.

### 6.3.3. Research methodology

#### Sample

A survey among construction firms and building users was conducted in R. Macedonia in order to collect data relevant for the research – modeling the building energy consumption –  $Q$  [kWh/m<sup>2</sup>/year] as target. Data were collected for 55 residential buildings constructed/reconstructed during the period of the last five years. From all available data: type of structure, Vint, Vext, Awall, Uwall, Uroof, Ht', Degree day, correction for thermal bridges, Aheated, Aenvelope, f0, Awindow, Uwindow, Aroof, Afloor, Ufloor, Htr and hours for heating, several were chosen as most representative for building the most accurate model. The data were related to:

- The thermal transmittances (in W/m<sup>2</sup> K) of: roofs (Uroof), floors (Ufloor), walls (Uwall), windows (Uwindow), as well as
- Their corresponding geometries and areas (in m<sup>2</sup>) – areas of the: roofs (Aroof), floors (Afloor), walls (Awall) and windows (Awindow).

## Method

Neural networks (NN) are soft computing data-driven methods which try to implement some aspects of the intelligence of nature beings, such as learning from experience, recognition of objects, or generalization from learned rules, into models and algorithms (Kecman, 2001).

NN algorithms are being used to obtain the relationship between input (predictors) and output (target variable) of the system, using some available data set for training, which should be most representative for the process that should be modelled. After the process of training, the NN model is being tested on unknown data for validating how well it will generalize to new unseen data. The most important way for providing generalization to unknown data is choosing the most representative predictors from the data set, which will present the whole process.

When there is accurate mathematical form of the process that should be modelled, i.e. there is a so called process-based model of the process, which is expressed with reasonable number of equations which solve the task with acceptable accuracy, time and cost, then there is no need of data-driven models like NN, but when one or more of these requirements are not satisfied, then NNs are very significant alternative, specially having in mind that many process-based models are only approximation of the real processes because there are many variables that influence the process and which are not included in the analytical form of the process. Also, traditional, hard-computing methods, requiring a lot of computational time are no longer appropriate for many contemporary problems. Learning from experimental data, NN techniques have been of great interest in the last several decades for modelling partially known or unknown processes with highly nonlinear nature, solving many problems in contemporary science, specially engineering (Kecman, 2001).

In this paper for predicting the target variable – building energy consumption, the soft-computing technique general regression neural network (GRNN) is used. Short explanation of the GRNN algorithm shall be given in the next section.

### GRNN (General regression neural network)

Regression of the target (dependent) variable  $y$  on the independent variable  $X$  (predictor) is defined as computing the value of  $y$  which is most probable, for each value of  $X$ , using finite number of measurements of  $X$  and the corresponding values of  $Y$ .  $X$  can be vector with one or more components, i.e.  $y$  can be dependent on one or more predictors (independent variables).

GRNN (general regression neural network) is being used successfully for nonlinear regression problems, for prediction, mapping and control problems (Specht, 1991) and in most of the cases it is very accurate. One of the most practical characteristics of GRNN is that it converges to the optimal solution very fast, requiring only few training samples. The architecture of the GRNN is presented in Fig1 (Specht, 1991).

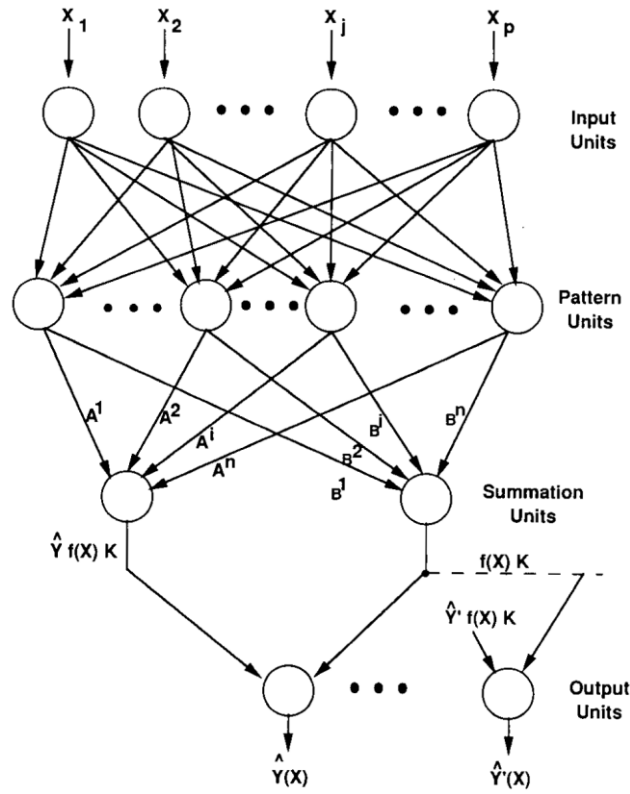


Fig. 1 GRNN architecture (Specht, 1991)

GRNN has parallel structure and it consists of four units (layers): input, pattern, summation and output units. The input unit has number of neurons equal to the number of predictors. The neurons from the next pattern unit receive the values of the predictors from the neurons from the input unit and each neuron from this pattern unit stores one case (row) from the training dataset. For each test case Euclidean distance from the centre of the neuron is computed, after which kernel function is applied and that value is delivered to the next summation unit. The summation unit has two neurons: numerator and denominator. The numerator neuron sums the weight values multiplied by the actual value of the target variable from the neurons of pattern unit. The denominator neuron sums the weight values from the pattern unit's neurons. The predicted target value is computed in the decision (output) unit where the value of the numerator is divided by the value from the denominator from the previous summation unit (Specht, 1991; Sherrod, 2013a).

The above computations in the four units from GRNN implement the equation (eq.1) (Specht, 1991):

$$y(X) = E[y / X] = \frac{\int_{-\infty}^{\infty} y f(X, y) dy}{\int_{-\infty}^{\infty} f(X, y) dy} \quad (1)$$

X is the input vector (with one or more components – predictors), y is the target variable, f(X,y) is their mutual probability density function and E[y/X] is the conditional expectation of y. Using finite number of observations for X and y, Parzen estimators (Parzen, 1962) are being applied for estimation of the function f(X,y) if it is not known.

#### 6.3.4. Results

As predictor (independent) variables for predicting the target variable Q (building energy consumption); for building the model with highest accuracy, only 10 variables were chosen; Aheated, Aenvelope, f0, Awindow, Uwindow, Aroof, Afloor, Ufloor, Htr and hours for heating. GRNN (general regression neural network) from the



predictive modelling software DTREG was used as predictive model (Sherrod, 2013a). Before entering the DTREG software, the data were normalized.

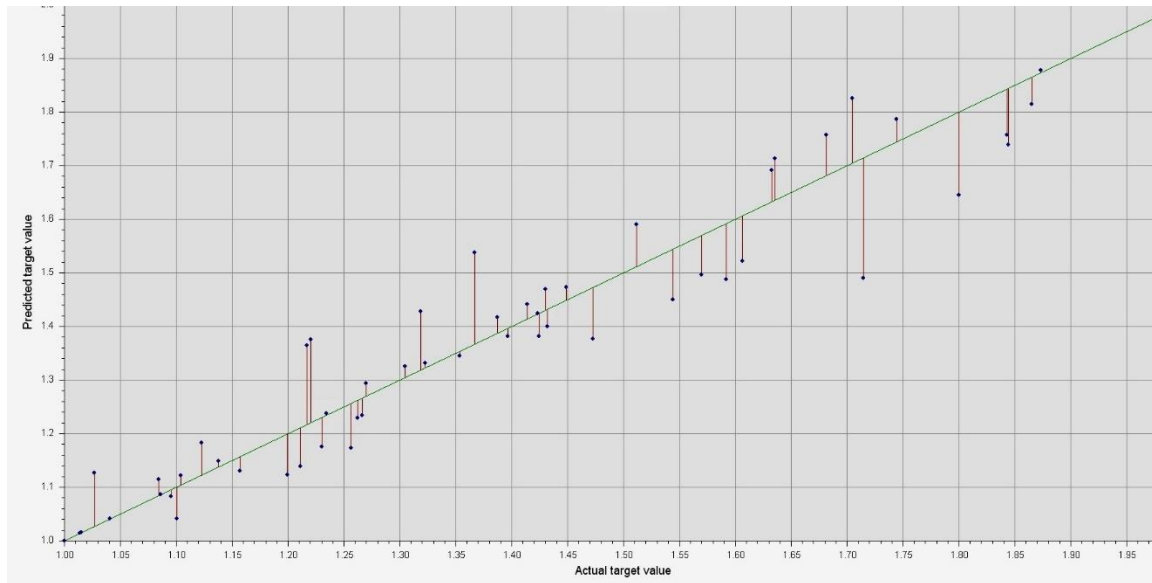
The accuracy of the model is presented by the most used estimators: MAPE (*mean absolute percentage error*) and  $R^2$  (*the coefficient of determination*), which show the general suitability of the model, are: MAPE = 3.12 % and  $R^2$  = 91.70% (Table 1, Sherrod, 2013a).

Table 1. Accuracy of the model for training and validation data

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>--- <b>Training Data</b> ---</p> <p>Mean target value for input data = 1.3836901<br/>Mean target value for predicted values = 1.3805782</p> <p>Variance in input data = 0.0630846<br/>Residual (unexplained) variance after model fit = 0.0067013<br/>Proportion of variance explained by model (<math>R^2</math>) = 0.89377 (89.377%)</p> <p>Coefficient of variation (CV) = 0.059162<br/>Normalized mean square error (NMSE) = 0.106228<br/>Correlation between actual and predicted = 0.945591</p> <p>Maximum error = 0.2244937<br/>RMSE (Root Mean Squared Error) = 0.0818617<br/>MSE (Mean Squared Error) = 0.0067013<br/>MAE (Mean Absolute Error) = 0.0633965<br/>MAPE (Mean Absolute Percentage Error) = 4.4712609</p> <p>--- <b>Validation Data</b> ---</p> <p>Mean target value for input data = 1.3977729<br/>Mean target value for predicted values = 1.3746414</p> <p>Variance in input data = 0.0877396<br/>Residual (unexplained) variance after model fit = 0.0072829<br/><b>Proportion of variance explained by model (<math>R^2</math>) = 0.91699 (91.699%)</b></p> <p>Coefficient of variation (CV) = 0.061054<br/>Normalized mean square error (NMSE) = 0.083005<br/><b>Correlation between actual and predicted = 0.968796</b></p> <p>Maximum error = 0.2465857<br/>RMSE (Root Mean Squared Error) = 0.0853397<br/>MSE (Mean Squared Error) = 0.0072829<br/>MAE (Mean Absolute Error) = 0.0506737<br/><b>MAPE (Mean Absolute Percentage Error) = 3.1203754</b></p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The *coefficient of correlation* between the actual and the predicted target values is 0.969. The method for validation and testing the model was Random percent. DTREG offers the option for reducing the number of neurons for optimization of the model. This option was used and 19% from all rows from the input data were used for validation of the model. The number of neurons was reduced to 28 neurons after the process of optimization.

The chart for the dependence of the actual and predicted values on the target variable is given in Fig. 2 (Sherrod, 2013a).



*Fig. 2 Chart for the dependence of the actual and the predicted target values*

DTREG software computes the importance of each predictor variable for the built model. This report is given in Table 2.

*Table 2. Overall importance of variables*

| Overall importance of variables |            |
|---------------------------------|------------|
| Variable                        | Importance |
| Afloor                          | 100.000    |
| Aroof                           | 98.657     |
| A heated                        | 49.630     |
| f0                              | 38.842     |
| A envelope                      | 37.409     |
| Awindow                         | 37.181     |
| Htr                             | 32.595     |
| Ufloor                          | 15.804     |
| hours for heating               | 8.274      |
| Uwindow                         | 0.832      |

### 6.3.5. Discussion

For the purpose of comparison and selecting the best model with highest accuracy, besides GRNN four other predictive models were built with the same variables, using the Random 19% method for validation: SVM (support vector machine), RBF NN (radial basis neural network), LR (linear regression) and MLP (multilayer perceptron) using DTREG software. The best accuracy was obtained with GRNN (Table 3, Sherrod, 2013a).

Table 3. Comparison of the accuracy with 4 other predictive models

| Type of predictive model | MAPE (%) | R <sup>2</sup> (%) | Coefficient of correlation between actual and predicted target values |
|--------------------------|----------|--------------------|-----------------------------------------------------------------------|
| SVM                      | 3.93     | 91.67              | 0.962                                                                 |
| LR                       | 7.43     | 82.58              | 0.910                                                                 |
| RBF NN                   | 5.27     | 88.68              | 0.960                                                                 |
| MLP NN                   | 5.83     | 86.08              | 0.938                                                                 |
| GRNN                     | 3.12     | 91.70              | 0.969                                                                 |

Using the Multiple Regression technique authors Amber et al. (2017) developed a model for predicting the daily electricity usage of university buildings. Predicted model results were compared with the real data for buildings electricity consumption. Model results were associated as follows: 13% for the academic building with a Normalized Root Mean Square Error (NRMSE) and 12% for the administrative building.

For predicting building' energy consumption Ekici and Aksoy (2009) used backpropagation neural network. Results had prediction rate of 94.8–98.5% and deviation of 3.43%.

Authors Yedra et al. (2014) have developed a predictive model for electricity demand for research center CIESOL with good final results for real data, with maximum root mean square error of 5% for validation data.

For improvement of the accuracy of the model the authors plan their future research to focus on studies of some hybrid predictive models which combine process-based and data-driven models, which have shown very promising results in the last several years. Also, models for different types of structures (such as: residential buildings, commercial buildings, etc.) are expected to be developed.

### 6.3.6. Conclusion

Forecasting the building energy consumption with model developed for that purpose is useful for all project participants in order to design and build a building with good energy performances. Hence, this paper presents a model for forecasting the building' energy consumption using GRNN (general regression neural network).

Based on the measured results of 55 residential buildings in Macedonia, this paper establishes the prediction model of annual energy consumption of residential buildings using GRNN. Five different modeling methods were developed: support vector machine (SVM), MLP (multilayer perceptron, radial basis function neural network (RBFNN), general regression neural network (GRNN) and LR (linear regression). Simulation results show that SVM and GRNN methods achieve better accuracy and generalization than MLP and RBFNN methods, and are effective for prediction of annual building energy consumption. The best prediction was obtained with GRNN with MAPE = 3.12% and coefficient of determination  $R^2 = 91.70\%$ .

The main conclusion of the study is that AAN models for building' energy forecasting gave satisfactory prediction accuracy.

The proposed model is useful for choosing the optimal variant of buildings design and for cost estimation for buildings' energy usage. Its limitations mainly refer to the type of variables from the dataset which depend on climate region. Nevertheless, the model can be used as an experience for developing other models regarding energy consumption of buildings.

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## 6.4. Renewable Energy Integration in Urban Systems: Case Study of Armutlu District

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### 6.4.1. Abstract

The urban energy systems significantly affects the health, happiness and well-being of inhabitants. Smart cities with high renewable energy usage, low fossil fuels fraction and efficient energy management strategies are essential for achieving aspiring targets of the climate protection. Renewable energy sources such as geothermal, wind and solar energy can be used in numerous applications in urban systems and adds value to the cities. Due to its geographical and geological location, Turkey is one of the most abundant countries in the world, in terms of renewable energy potential. Armutlu is a touristic town which has been declared as a thermal culture and tourism protection and development zone by the Culture and Tourism Ministry of Turkey. Since 2006, the installed capacity of the drilled geothermal wells in the region has been increased eight times. Currently, geothermal energy has been using for various applications in the district, including space heating, greenhouse heating, agricultural drying, bathing and swimming. Moreover, in order to provide electricity supply, thirty-six wind turbines with a total capacity of 54 MW have been installed. This article outlines the renewable energy applications of Armutlu district. It is shown that renewable-based energy systems provides numerous benefits to communities from an economic, social, environmental and energetic point of view.

**Keywords:** Geothermal energy, District heating, Greenhouse heating, Drying system, Urban

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### 6.4.2. Introduction

Energy is the most important indicator for the economic development of any country. Today, annual global energy demand is 16 Terra Watt and 85% of it comes from fossil fuels. Achieving energy self-sufficiency and sustainability is one of the most important policy instrument for governments in order to guarantee energy supply security (Ozcan, 2018). As a result, renewable energy systems are the most effective solutions to reach energy independency and sustainable development.

Energy supply of Turkey is mostly dependent on imports. According to recent figures, only one-third of the energy demand in Turkey is able to meet by its native utilization (Boran, 2018). In order to decrease its dependence on finite energy sources, Turkey should increase its energy share on renewable sources (Altun and Kılıç, 2018). In figure 1, primary energy consumption of Turkey by fuel is presented. As it can be seen from the figure, despite the fact that Turkey has substantial renewable energy potential, only 4% of its primary energy was utilized by renewable resources in 2016. In order to diversify its energy sources and decrease its energy dependency, Turkey is aiming to increase the share of renewable energy in electricity production to be 30 % in 2030.

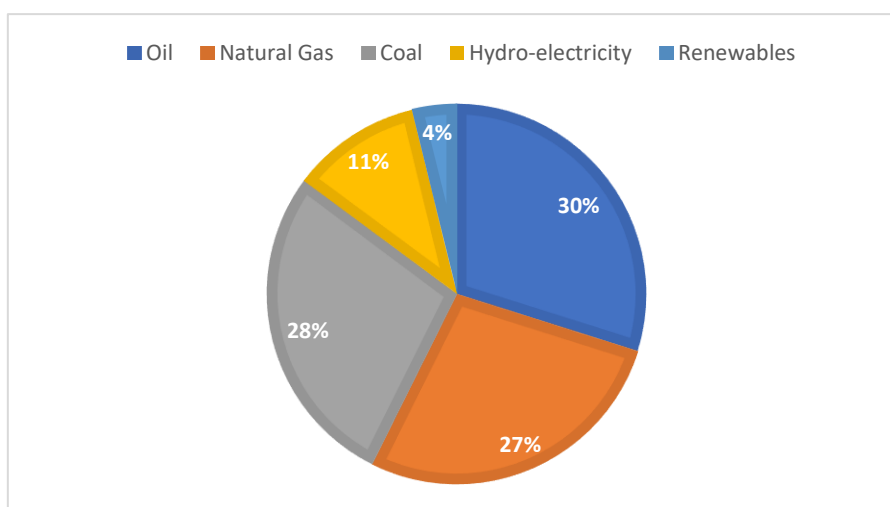


Figure 1. 2016, Primary energy consumption of Turkey by fuel (BP Report, 2017)

In Table 1, recent renewable energy incentives in Turkey according to Renewable Energy Law (2010) is presented. This law offers a purchasing guarantee of a defined price has been given to the electricity from renewables for 10 years after the plant is commissioned (Yazar, 2013).

Table 1. Renewable energy incentives in Turkey (Kilic, 2016)

| The plant type of the generation of energy from renewable resources | The prices that will be applied (USD cent/kWh) |
|---------------------------------------------------------------------|------------------------------------------------|
| A hydroelectric power plant                                         | 7.3                                            |
| A wind power plant                                                  | 7.3                                            |
| A geothermal energy plant                                           | 10.5                                           |
| A biomass supplier                                                  | 13.3                                           |
| A solar energy plant                                                | 13.3                                           |

The urban energy systems significantly affects the health, comfort, psychology and well-being of people. Smart cities with high renewable energy usage, low or zero fossil fuels fraction and efficient energy management strategies are essential for achieving aspiring targets of the climate protection. According to a study conducted by Eicker and Klein (2014), in order to reach CO<sub>2</sub> reduction in municipalities, urban energy improvement process should be organized in four steps:

- Energy auditing on a city scale.
- Analyzing the renewable energy potentials in the urban area.

- Defining the urban energy development targets to achieve them in a specified period.
- Defining the implementation strategy.

Considering urban environment, there are two approaches possible to integrate renewable energy in order to meet the thermal or electric energy demand of buildings: an individual and a collective approach (Van Leeuwen et al. 2017). A collective energy system serves large number of buildings, whereas an individual energy system only serves a single building.

Among the renewable energy sources, geothermal energy has the greatest potential to save a nation from the negative effect in the energy supply, price and related environmental concerns (Hepbasli, 2010). Turkey is one of the most abundant countries in the world, in terms of geothermal potential. Annual direct geothermal energy utilization in Turkey has increased for the last 40 years and ranked among the top five countries in the world (Yamankaradeniz, 2016).

Geothermal resources are classified according to their temperature ranges. High temperature resources (150°C) are being utilized for generation of electric power, whereas low and medium temperature geothermal resources (50-150 °C) are mostly being utilized in direct use applications such as space heating of individual buildings or entire districts (Gupta and Roy, 2007).

The direct use applications of geothermal energy can be listed as follows: heating/cooling buildings, spaces and greenhouses, healthcare and treatment applications, thermal tourism applications (hot springs, spas, balneological uses of geothermal water), fish farming, aquaculture productions, farming (crops, fruit, vegetable drying), process heat supply and geothermal heat pump applications (Kilic, 2016).

With modern technology, geothermal resources with 50-60 °C have been more widely used for district heating systems, with peaks following the oil crises in the 1970s (European Geothermal Energy Council, 2014). In terms of space heating applications, Turkey is among the leading countries in geothermal development (Ozgener et al. 2007). Geothermal district heating applications have started in 1987 in Turkey with the Balikesir-Gonen district heating system for 600 residences, since then geothermal energy district heating system applications have reached up to 300,000 residences capacity (Hepbasli and Canakci, 2003).

Numerous studies were carried out in the literature for investigating energy efficiency of district heating systems in Turkey. Aslan et al. (2014) investigated the effect of different operating conditions of the Gonen geothermal district in Balikesir on its annual energy and exergy performance. Erdogmus et al. (2006) evaluated the Balcova-Narlidere geothermal district heating system which is one of the largest district heating system in Turkey from an economic perspective. Arslan et al. (2009) investigated the impact of the parameters of heating circuit on the Kütahya Simav district heating system by means of energy, exergy and life cycle cost concepts and optimized the district heating network. Kecebas (2013), conducted a study deals with an energetic and exergetic analysis as well as economic and environmental evaluations of Afyon geothermal district heating system in Turkey. Kalinci et al. (2008) conducted a study deals with the determination of optimum pipe diameters based on economic analysis and the performance analysis of İzmir Dikili geothermal district heating system. Lund et al. (2010) conducted a study to analyze the role of district heating in future renewable energy systems. The study shows that a substantial reduction in fuel demands and CO<sub>2</sub> emissions as well as fuel costs can be achieved by expanding district heating areas up to 70 per cent in Denmark.

Drying vegetables and fruits is defined as the application of heat under controlled conditions for removing the majority of water normally present in a food by evaporation (Kostoglou et al. 2013). This application is one of the oldest methods of food preservation. In industrial countries, drying process use 7-15 percent of total industrial energy consumption as a result of that it is necessary to use clean and efficient energy sources in those applications (Van Nguyen, 2015). Low-to-medium enthalpy (temperatures less than 150°C) geothermal energy resources are utilized for drying various grains, vegetables and fruit crops in many countries. According to the study of Lund et al. (2011), geothermal energy utilized drying examples include: seaweed (Iceland), onion (USA), wheat and other cereals (Serbia), fruit (El Salvador, Guatemala and Mexico), coconut meat (Philippines), and

timber (Mexico, New Zealand and Romania). There are various articles in the literature about vegetable, fruit, crop and grain drying using geothermal water. Afuar et al. (2016) conducted a research to design a tomato drying system by extracting heat of geothermal brine. Helvacı and Akkurt (2016), designed and constructed a geothermal cabinet type dryer situated in Balcova-Narlıdere Geothermal Field, Turkey where the clean city water of district heating system is used as an energy source for the dryer. Basak et al. (2014) investigated the feasibility of vegetable drying by geothermal heating at city of Kirsehir.

Apart from space heating and agricultural drying, one of the most important applications of geothermal energy is for heating greenhouses. The greenhouse cultivation is a production method that provides high income in narrow lands (Kadioglu, 2013). The main crops grown in greenhouses are vegetables and flowers (Lund et al. 2011). There are numerous reasons for preferring geothermal energy in greenhouse heating applications. Some of the reasons are as follows: (Gunerhan, 2011)

- Greenhouses heating systems need the lowest enthalpy values in agricultural industry energy consumption.
- Geothermal energy applications require relatively simple heating systems.
- In many cases, it is more economical to use geothermal energy for greenhouse heating.
- Strategic importance of using regional energy sources for local food production.

In Turkey, geothermal greenhouse heating has become very popular. Currently, the total area of geothermal-heated greenhouses is about 210.44 ha, with a heating capacity of 207.44 megawatts thermal (MWt) (Van Nguyen, 2015). There are various articles in the literature about greenhouse heating with geothermal resources. According to the research of Cercioğlu and Sahin (2016), the use of geothermal energy in greenhouses of Simav region provides significant economic and environmental benefits. Duffield and Sass (2003) showed that the use of geothermal resources in greenhouses instead of conventional energy sources decrease energy fuel costs by about 80 per cent.

In this research, a case study of Armutlu district in Turkey is presented in order to show the benefits of renewable energy utilization for variable applications. It was determined that several different geothermal technologies can be applied in the Armutlu district including, geothermal district heating, agricultural drying, greenhouse heating and balneological treatment procedures. In addition to geothermal applications, Turkey's 37<sup>th</sup> largest wind farm is installed consisting of thirty-six wind turbines in Armutlu District. Turbines produce enough electricity to meet all of the energy requirements needed by 28,351 people for domestic, industrial, transportation, urban lighting purposes. Renewable energy integration into urban environment can make a significant contribution to minimizing environmental pollution and enhancing human health and comfort. Armutlu district is a sustainable, low-carbon and livable urban area example for all city policy makers, designers and urban planners in the world.

#### **6.4.3. Armutlu District**

Armutlu is a touristic town of Yalova Province in the Eastern Marmara region of Turkey. Armutlu currently has 8,848 inhabitants and during summer season the population exceeds 60,000.

There is not rapid increase in the population of the town as a result of the structure of the land and the limited availability of employment opportunities. Armutlu District's economy is largely dependent on olive farming, fisheries and thermal tourism. With the ambition of making Armutlu district a more popular thermal tourism destination and an energy independent town, municipality strongly supports application of renewable energy systems. In order to provide electricity sustainably, thirty-six wind turbines with a total capacity of 54 MW have been installed and the facility generates 210 GWh electricity annually. This means, every year 100,000 tons of greenhouse gas emissions will be prevented to be released into the atmosphere.



Figure 2. Armutlu District

A multi-step geothermal project ARJESS has been supported by the municipality and the Tourism Ministry of Turkey for geothermal development of the Armutlu district.

The project is divided into 4 steps:

- Reservoir exploration studies were carried out in order to find out the capacity of the geothermal field.
- By drilling new geothermal wells, the mass flow rate of the thermal water has been increased.
- Thermal water is collected in one heating center and then moved to the district center which is 3.5 km away.
- Thermal water is distributed from district center to the thermal tourism areas in a controlled manner.

#### Geothermal Space Heating and Hot Water Supply

Seven wells (AR1, AR2, AR4, AR7, AR8, AR9 and AR10) are currently available for the use of production. Flow rates, water temperatures and depth of the wells is presented in Table 2. Geothermal fluid collected from wells is pumped into Heat Center 1 (HS-1) with 75 °C temperature and 0.178 m<sup>3</sup>/s total volumetric flow rate. All of the water collected from geothermal wells is managed from Heat Centre 1. A distribution line from geothermal field to the city center with a total length of 3.2 km is designed. In order to manage the water distribution to the hotels and public buildings, secondary and tertiary heating centers (HS-2, HS-3) are built and the water is supplied from these centers to the thermal hotels and public buildings in order to provide domestic hot water and space heating. With using electronic water meters the changes in flow rate of the production wells are monitored instantaneously. Geothermal water in Heat Center 1, is transferred to the Heat Center 2 in the district center and to the Heat Center 3, via frequency converter pumps. Within the scope of this project, thermal water is distributed to four different hotels with a 23,595 m<sup>2</sup> total gross area and 1,000 total accommodation capacity. In addition, 3,000 m<sup>2</sup> municipality building of Armutlu district, Hasan Ali Paşa and Karşıyaka Mosques and stores owned by the municipality are heated by geothermal water as well. In Table 3, length and pipe diameters of the distribution lines are presented.

Table 2. Flow rates, water temperatures and depth of the wells

| Designation of the well | Temperature | Max. Volumetric Flow Rate | Depth of the well |
|-------------------------|-------------|---------------------------|-------------------|
| AR-1                    | 76.3 °C     | 0.007 m <sup>3</sup> /s   | unknown           |
| AR-2                    | 76.2 °C     | 0.005 m <sup>3</sup> /s   | 507 m             |
| AR-4                    | 69.9 °C     | 0.0023 m <sup>3</sup> /s  | 750 m             |
| AR-7                    | 76 °C       | 0.041 m <sup>3</sup> /s   | 207 m             |
| AR-8                    | 78 °C       | 0.003 m <sup>3</sup> /s   | 400 m             |
| AR-9                    | 74 °C       | 0.06 m <sup>3</sup> /s    | 292 m             |
| AR-10                   | 74 °C       | 0.06 m <sup>3</sup> /s    | 350 m             |



Figure 3. Heating Center 1



Figure 4. Heating Center 2

In Figure 5, geothermal distribution network of Armutlu district is presented. The system operates at variable flow rate via frequency converter pumps. The pressure difference in the circuit is continuously controlled and demanded energy is provided at the instantaneous flow rate and the heat balance of the system is achieved. Frequency converters prevent unnecessary flow circulation in the system and avoid unnecessary electricity consumption. Geothermal fluid is sent to the heat exchanger in the heating center and is cooled about 60 °C. Also, the clean water from national grid is pumped to the heat exchanger and the outgoing water is sent directly to the buildings. The average temperatures obtained during the operation of Armutlu Geothermal District Heating System are 75/70 °C (between geothermal well loop and geothermal heating center loop), 70/60 °C and 62/20 °C for the heat exchanger, 62/46 °C for the building circuits.

When the project has been completed, total investment value of the thermal facilities in Armutlu is determined as 66 million dollar. Thermal water that distributed to the hotels contributes 550,000 dollar revenue annually to the budget of the municipality. Currently, a number of new thermal facility projects are ongoing with 27,000 accommodation capacities and will be completed in the upcoming years.

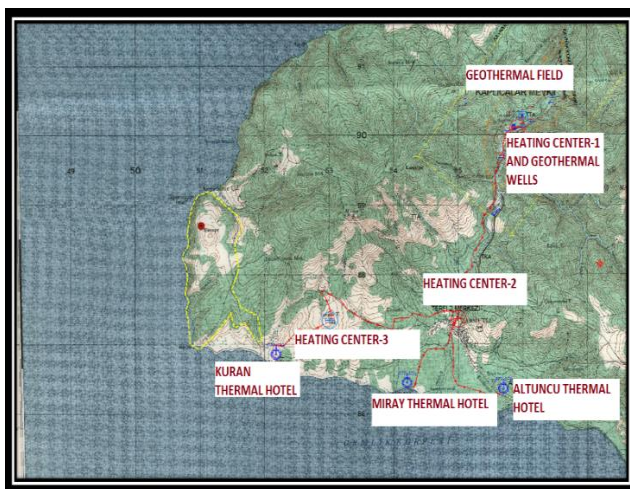


Fig. 5. Main geothermal network of the ARJESS Project



Fig. 6 Distribution network



| Distribution lines             | Length of the line (m) | Inner and Outer Pipe Diameter (mm) |
|--------------------------------|------------------------|------------------------------------|
| Heating Center 1-2             | 3.204                  | 200/280                            |
| Heating Center 2-3             | 2.786                  | 200/280                            |
| Heating Center 2-Altuncu Hotel | 2.041                  | 110/180                            |
| Heating Center 2-Miray Hotel   | 1.497                  | 75/130                             |
| Heating Center 3-Kuran Hotel   | 888                    | 110/180                            |
| Heating Center 3-Göral Termal  | 750                    | 90/110                             |
| TOTAL LENGTH                   | 11.166 m               |                                    |

Table 3. Length and pipe diameters of distribution lines

### Balneotherapy

Geothermal water has been used for medical treatment for centuries. Thermal water in geothermal fields vary greatly in composition from place to place (Lund, 2018). Armutlu geothermal field is an environmental and economic asset for the Marmara Region of Turkey. Every year, thousands of tourists visit thermal hotels, spa facilities and generate a great revenue for the local economy. The springs of Armutlu is very attractive in terms of balneotherapy with a total dissolved minerals of 2043 mg/L. According to the mineral composition, geothermal water of Armutlu district can be classified as Sodium Chloride Sulphated Calcium and Bicarbonate water and can be used for medical treatment and therapy for a broad range of diseases including degenerative joint diseases, rheumatic diseases and chronic back pain.

### Greenhouse Heating

There are various applications of direct geothermal energy use including district heating, agricultural drying, thermal springs, geothermal heat pumps, greenhouse heating etc. Figure 7, shows geothermal energy usage distribution rates in Turkey (Tubitak, 2015). Referring to the data in Figure 7, in terms of direct geothermal energy applications, thermal springs has the greatest share, district heating and greenhouse heating takes the second and third places.

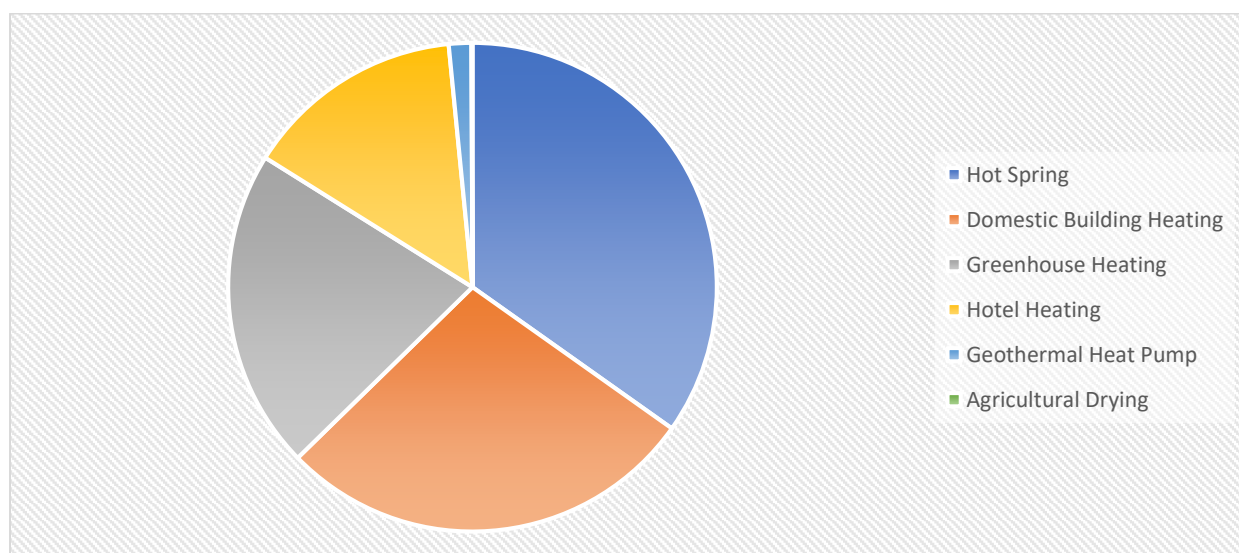


Fig. 7. Geothermal Energy applications distribution in Turkey (Tubitak, 2015)

In greenhouses, maintaining the required temperature is essential because it has a direct impact on product quality. The utilization of geothermal energy for greenhouses is very popular because of the significant heat requirements for these facilities and thus a large operating cost savings in fossil fuels (Lienau, 1997). Geothermal energy requires relatively simple heating installations for greenhouse heating (Ragnarsson and Agustsson, 2014). According to Mburu (2014), geothermal based greenhouse heating systems consist of various subsystems;

- A geothermal heating circuit located at the well site,
- A fresh water distribution circuit that transports heat from geothermal water to the greenhouse area,
- Frequency control pumps for controlling the mass flow rate of both geothermal and distribution circuits.
- A heat exchanger where heat transfer takes place

With the ongoing project in Armutlu district, cut-flower greenhouses will be heated by geothermal energy. Technical and economic viability of the geothermal energy utilization in cut-flower greenhouses is investigated and the implementation of the project will be fulfilled in the near future.

#### **Agricultural Drying**

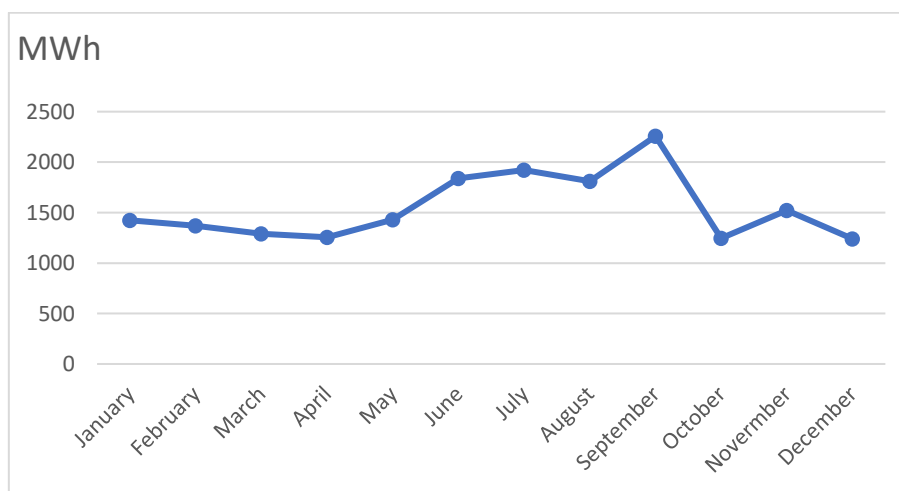
In many agricultural communities, large quantities of agricultural products are dried for improving shelf life, reducing packaging costs, lowering shipping weights and maintain nutritional value (Gunhan et al. 2005). In this regard, geothermal energy is a reliable solution in order to provide adequate heat for drying operation while minimizing operational costs and environmental impacts.

The interest and importance of olive leaves and bay leaves has increased because of their high and valuable phenolic and antioxidant contents (Erbay, 2008). Currently, olive leaves and bay leaves have been used in pharmaceutical and cosmetics industries as well as in food industries.

With the ongoing project in Armutlu district, a geothermal agricultural drying facility will be established with the contributions of East Marmara Development Agency. Drying of bay leaves and olive leaves will be practiced in that facility.

#### **6.4.4. Wind Energy Applications in Armutlu District**

Armutlu has a good wind energy potential and the annual average wind speed at the district is  $7.4 \text{ m s}^{-1}$ . In order to create the electricity load profile of Armutlu district, monthly average energy consumption data for 2012 was taken from UEDAS Utilities Inc. and presented in Figure 8. From January to December monthly consumption values are 1,425, 1,370, 1,291, 1,256, 1,429, 1,839, 1,920, 1,811, 2,257, 1,246, 1,521 and 1,240 MWh respectively and the annual energy consumption of the district is 18,605 MWh (Ince and Karakus, 2015).



*Fig.8. Monthly electricity consumption values of 2012 in Armutlu*

Most of the energy generated globally utilize fossil fuels involving the emission of environmentally hazardous greenhouse gases and the utilization of renewable energy resources can make the energy use clean as well as sustainable (Khan and Arsalan, 2016). Despite the fact that, there are several options for sustainable electricity generation in the district, since wind energy potential is very advantageous, Turkey's 37<sup>th</sup> largest wind farm is installed consisting of thirty-six wind turbines in Armutlu District. Total capacity of the turbines is of 54 MW. Turbines produce enough electricity to meet all of the energy requirements needed by 28,351 people for domestic, industrial, transportation, urban lighting purposes. By doing so, facility generates 210 GWh electricity



annually and consequently every year 100,000 tons of greenhouse gas emissions are prevented to be released into the atmosphere.

Turkey aims to increase the fraction of renewable energy resources to 30% in its power utilization until 2030. Today, the installed wind energy capacity is approximately 5 GW and government's target is increasing this capacity up to 20 GW until 2023 (Kilickaplan et al. 2017). Currently, wind energy investments have increased in parallel with the ninth development plan and Renewable Energy Law which was enacted in 2005 (Yaniktepe et al. 2013). Renewable energy investments are encouraged by feed-in-tariffs and incentives. According to this law, government guarantees to buy electricity generated for ten years offer feed-in tariff. The price that will be applied to a wind power plant is 7.3 USD cent/kWh (Simsek and Simsek, 2013). In Armutlu District, if the electricity utilized by wind turbines is higher than the energy requirement of the town, the redundant energy can be sold directly to the state. If the electricity generated via turbines does not meet the energy requirement of the town, required amount can be purchased from the national grid.

#### 6.4.5. Solar Energy Potential in Armutlu District

Due to its geographic situation, Turkey is one of the most abundant countries in Europe in terms of solar energy. Turkey's solar energy potential has estimated to be 26.4 million toes as thermal and 8.8 million toes as electricity (Balat, 2005). Despite the fact that Turkey is located in a sunny belt between 36°C and 42°N latitudes and solar energy can provide significant amount of power, solar energy using in electricity generation is almost negligible due to high initial costs and lack of adequate financial resources (Toklu, 2013). Currently, solar energy has been mostly used for water heating via solar thermal collectors, however, starting from 2010s, there has been a growth trend in photovoltaics (Melikoglu, 2016).

Solar potential of Armutlu district is also promising. In figure 9, monthly average solar radiation values of the district is presented and in figure 10, monthly, average sunshine duration is presented.

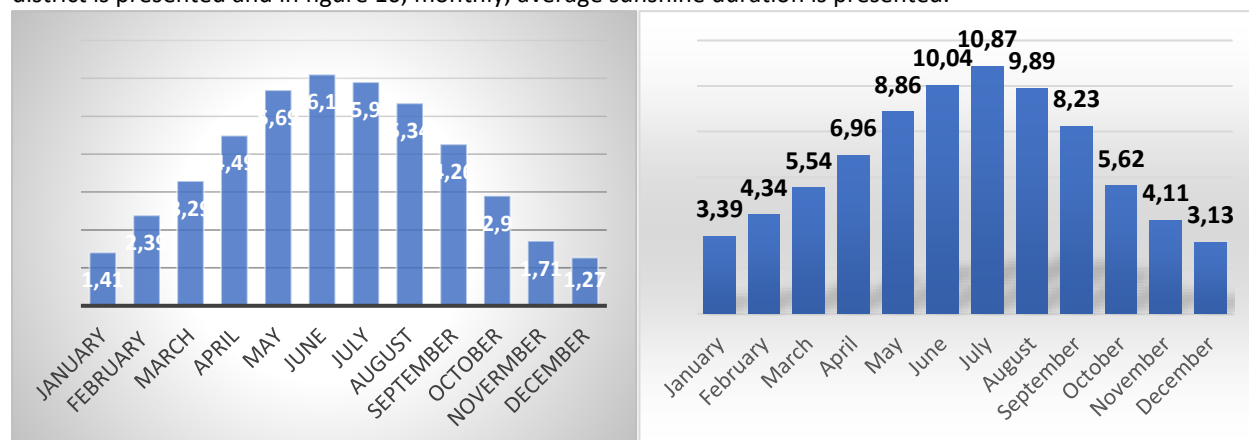


Fig. 9 Annual Average Solar Radiation Values of Armutlu (kWh/m²)

Fig. 10 Average Annual Sunshine Duration (hour/day)

As it can be seen in Figure 10, during summer season, average sunshine duration is 10 hours per day. As a result, implementation of photovoltaic panels can offer numerous benefits and improve the energy efficiency of the district. To achieve the goal of implementation 100% of sustainable resources in Armutlu district, integration of solar energy into the urban energy system is essential.

#### 6.4.6. Obstacles in Geothermal Development

In order to improve urban planner or designer's capacity to meet its objectives to fulfill a sustainable development project, it is very crucial to identify the obstacles of practitioners engaged in such effort (Filion et al. 2015). In this part of the study, some challenges related with Armutlu District's sustainable development efforts are presented in order to inform other researchers, designers and planners. The varying obstacles which make the district's geothermal development slower include (Tubitak, 2015):

-Technical expertise is crucial in terms of geothermal applications. Lack of qualified staff is a common problem in developing countries.

- Government policies and legislation are important factors in creating an enabling environment for geothermal investment (Van Nguyen, 2015). Only a few countries have clear legislations in terms of geothermal development. However, in many countries, legislation does not encourage investors to invest in geothermal energy. Most developing countries suffer from inadequacy of regulations, incentives related with geothermal applications.

In order to overcome these obstacles and achieve renewable energy targets some strategies include:

-Incentives related to geothermal utilization should be more attractive.

-Related legislation should be revised and rearranged according to the feedback of the consumers, designers, investors.

-In geothermal regions, trainings which emphasize the importance of geothermal applications should be given by the experts in order to raise the awareness of the consumers, inhabitants and employees.

-Increasing the integrated use of geothermal resource is crucial. For instance, the companies that use geothermal energy to generate electricity can be use the waste heat for secondary purposes such as greenhouse heating, drying, cooling, etc.

#### **6.4.7. Conclusions**

Since cities are significant contributors to global climate change, designers, policy makers, urban planners have to look for more reliable options to establish sustainable energy systems in urban areas. Sustainable urban energy systems can make a crucial contribution to a country's economic, environmental and energy goals. This article mainly focuses on integrated renewable energy applications and sustainable energy development approach of Armutlu district for setting an example to other urban planners and researchers. Geothermal energy has been using for various applications in the district, including space heating, greenhouse heating, agricultural drying, bathing and swimming. A multi-step geothermal project ARJESS has been supported by the municipality and the Tourism Ministry of Turkey for geothermal development of the Armutlu district. Apart from geothermal energy, thirty-six wind turbines with a total capacity of 54 MW have been installed and electricity is supplied to inhabitants sustainably. By doing so, facility generates 210 GWh electricity annually and consequently every year 100,000 tons of greenhouse gas emissions are prevented to be released into the atmosphere. Solar potential of Armutlu District is also promising. With the integration of solar energy into the urban energy system, Armutlu District can utilize its own energy 100% from sustainable resources. Renewable energy applications can also generate job possibilities and contribute to the economy of Armutlu district. In addition, some challenges related with Armutlu District's sustainable development efforts and to overcome these obstacles some useful strategies are presented in order to inform other researchers, designers, policy makers and planners.

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## 7. Healthy Ageing

## **7.1. A tool to support the design process of smart living solutions: enabling older adults with early-stage dementia to live longer in their own homes.**

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### **7.1.1. Abstract**

The purpose of this research article is to construct a practical tool that gives designers better insight into the different stages and symptoms of dementia. The tool will support designers in designing smart living solutions. The aging population and a decline in the working force affect the Dutch healthcare system (Van Rijn, 2013) and policies are shifting from inpatient to outpatient care (Van Rijn, 2013). By integrating smart living solutions into the homes of older adults with early-stage dementia, we can enable them to live longer in their own homes. The smart living solutions can fully anticipate and adapt to the need of the user which can have a positive effect on their quality of life (Callahan, 1993; Cutchin, 2003). Before these fully integrated smart living solutions can be further developed, designers need to know the needs of the older adults with dementia. They need easily obtainable knowledge about the different symptoms and stages of dementia and how they influence daily life of the older adults.

**Method** – A literature research was performed in order to get a better understanding of the stages and symptoms of dementia. Based on two validated instruments, namely, the Global Deterioration Scale (GDS) (Reisberg, Ferris, de Leon, & Crook, 1982) and the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (Task force on DSM-V of the American Psychiatric Association, 2013), a new tool was constructed.

**Results and conclusions** – The constructed tool provides more insights into the actual needs of older adults with early-stage dementia and can be used as a departure point for designers to set up design criteria. Designers can use the tool to set up requirements and focus areas for further development of smart living solutions that optimally anticipate and adapt to the behaviour of older adults. The smart living solutions can stimulate mental, social, and physical health, and enable older adults with early-stage dementia to live longer in their own homes.

**Keywords:** Smart living solutions, Symptoms dementia, Early-stage dementia, Set of design criteria, Design tool.



### 7.1.2. Introduction

The aging society is one of the most significant social transformations of the 21st century (United Nations, 2015). Because of healthier lifestyles, and technological and medical innovations, the world's average life expectancy continues to rise. Nowadays, the average life expectancy in the Netherlands has risen to 81,5 years (CBS, 2017). In other countries, like Japan, the life expectancy has even risen to 83,7 years (World Health Organisation, 2016). As a result, the balance between population groups in the world is shifting, the population of older adults is growing faster than any other age group (United Nations, 2015). It is even expected that in 2030 the number of people aged over 60 years will have doubled and that the age group of 80 years and over will increase to a fourfold in 2050 (United Nations, 2002b).

There is not only an increase in the older population, also fewer children are born (United Nations, 2002a). As a result, the potential working force – compared to the group of older people – becomes disproportionate (CBS, 2015; United Nations, 2002a). This decrease of the potential working force leads to shortages of healthcare professionals (Huisman, 2017). While the demand for care increases due to the aging population.

If we take a closer look at the societal developments in the Netherlands it can also be seen that the aging population is an influential societal change that affects the healthcare system (Van Rijn, 2013). There is a shortfall of health care professionals, especially in home care nurses (Huisman, 2017; Swelsen, 2018; V&VN, 2016), while the demand for care is rising. Older adults have more (physical) limitations, including a higher risk of developing chronic diseases such as dementia (RIVM, 2016). 25 percent of the adults of 80 years old and 40 percent of the people over 90 have some form of dementia (Alzheimer Nederland, 2017a). In 2017, 270.000 people in the Netherlands had dementia. As a result of the aging population, it is expected that these numbers will rise to more than half a million older adults with dementia in 2040 (Alzheimer Nederland, 2017a). This increase is expected because dementia is inevitably connected with age (Jonker, Slaets, & Verhey, 2009).

### Dementia

Dementia is an umbrella term for more than fifty diseases that affect mental cognitive abilities because of damaged nerve cells or the damaged connection between these cells (Jonker et al., 2009; Perrin et al., 2008). It slowly affects a person's cognitive functioning and thus a person's ability to participate in society (Jonker et al., 2009). The most commonly known form of dementia is Alzheimer's disease. Around 70 percent of the dementia population has Alzheimer's disease (Alzheimer Nederland, 2017a). 20 percent of the dementia population has Vascular Dementia. Other forms are dementia due to general medical conditions (like HIV or Parkinson's disease) and substance-induced persisting dementia (drug or alcohol abuse) (Brankaert, 2016; Task Force on DSM-IV of the American Psychiatric Association, 1994). In this paper, we will not make a distinction between the different forms of dementia, because Alzheimer's disease and Vascular dementia together account for almost the whole population of dementia, and because the disease processes are relatively similar (Brankaert, 2016). That is why we will refer to dementia as a whole.

Dementia is a commonly known syndrome that affects many people, almost everybody has his or her own personal story. Because of these personal experiences, there are many stereotype images and statements about the syndrome. However, these images do not always match the actual state of a person with dementia. These differences between people that suffer from dementia are caused by the nature of the syndrome, it affects each person differently. This causes that every individual challenges other problems while living with dementia (Brankaert, 2016). Some general problems that people living with dementia can encounter are, among other things, problems with short- and long-term memory, language difficulties, problem-solving abilities, and orientation and behavioural problems (Jonker et al., 2009; Perrin et al., 2008; van Ingen Schenau, 2000). Other common problems with dementia are wandering, anxiety, and social isolation, which all pose a threat to the health of the person with dementia (Jonker et al., 2009; van der Plaats & Verbraek, 2016).

Another characteristic that makes it hard to get a clear image of the syndrome is that dementia is a progressive syndrome. It consists of different stages that are all quite distinctive. Symptoms that affect the older adult become worse during the process of the syndrome. Because of these characteristics, it is difficult to form a clear overview of the syndrome of dementia.

### **Smart living solutions**

Due to the increasing number of older adults with dementia in the population, healthcare legislation is being adjusted. Policies are shifting from inpatient (nursing home care) to outpatient (home) care (Van Rijn, 2013). Older adults are encouraged to live longer in their own homes. Only persons with a need for 24-hour care or supervision are eligible for inpatient care (Van Rijn, 2013). This concerns people with heavy care need with regard to social, psychosocial and cognitive functions, general daily life activities, mobility, nursing, and behavioural problems (Ministerie van Volksgezondheid, 2018). Because of these shifts in policy, older adults with early and moderate stage dementia are not or hardly eligible for inpatient care, so they are encouraged to live longer in their own homes (Van Rijn, 2013).

Despite these policy changes, we should ask ourselves whether it is sensible to let older adults with early-stage dementia live longer in their own homes. On one hand, older adults often want to remain living in their own homes (Callahan, 1993). People often lived in the same place for decades and are familiar with the environmental circumstances. Living independently at an older age also has a positive influence on the quality of life of the older adults with dementia (Callahan, 1993; Cutchin, 2003).

On the other hand, it is not always the safest option for a person with dementia to remain living at home. This can lead to dangerous situations like falling incidents, wrong intake of medication or fire hazards because people leave the gas on (Werkman, 2014). Also, health hazards like malnutrition and dehydration are common problems (Isaia et al., 2010; Velsink, 2014). Another large problem with older adults which remain living at home is the pressure on the informal caregiver, 54 percent of the informal caregivers are heavily loaded. Of this group, one in six feels overloaded with care tasks (Alzheimer Nederland, 2017a; Jansen, Werkman, & Francke, 2016).

New technological innovations can offer a solution for the rising demand in care. Smart living solutions like sensor floor systems, intelligent lights, and printable sensors can stimulate and support older adults with early-stage dementia and enable them to live longer in their own homes (Morris et al., 2013). However, these new smart living solutions should not make the life of the seniors more complex. Installing technologies into the home of the older adults can lead to misunderstanding and frustration because the process of dementia affects a person's ability to learn new skills. As a result, the older adults have a hard time in understanding newly installed smart living solutions (Reisberg et al., 1982). We, as designers, must therefore take into account that we do not just develop and add separate products to the homes of older adults with dementia. We should develop smart living solutions that are fully integrated into the home for the benefit of the user (Mohammadi, 2010). Smart living solutions that respond to the needs of the older adults and offer tailor-made support (Mohammadi, 2017). In this way, technology can contribute to maintaining the health of the older adults with early-stage dementia.

In order to develop these fully integrated smart living solutions a more empathic design strategy is required (Mohammadi, 2017). A strategy that enables the designers to learn more about the needs of their users and empathizes with them. Only when designers know the user they are able to design smart living solutions that anticipate and adapt to the user (Mohammadi, 2017).

### **Purpose**

Because of the aging population, an increase in the dementia population and shifting healthcare policies, older adults with early-stage dementia are encouraged to live longer in their own homes (Van Rijn, 2013). To enable older adults to live at home in a safe and healthy manner, new smart living solutions can be designed (Morris et al., 2013). Here lies a major task for designers, to design smart living solutions that fully adapt to the needs of the older adults with dementia. Dementia is a complicated syndrome that affects human functioning in many different ways (Jonker et al., 2009). For designers, it is not always easy to grasp this knowledge. That is why in this paper a tool was constructed that makes it easier for designers to gather information about the different stages and symptoms of dementia. This knowledge can be used to get a better understanding of the needs of older adults with early-stage dementia, and can eventually help with the development of smart living solutions that fully anticipate and adapt to the needs of the user. The tool will enable designers to set up requirements and focus areas for future design of smart living solutions.

The tool presented in this paper will be the start of a larger research on designing for older adults with early-stage dementia. The overview is a departure point and will eventually be used to set-up design criteria that can be used to develop design principles for the design of smart living environments. These newly designed smart living environments will enable older adults with early-stage dementia to live longer in their own homes (Morris et al., 2013). This can improve their quality of life and can decrease pressure on the Dutch healthcare system (Callahan, 1993; Cutchin, 2003). New technological solutions can also improve the quality of life of the informal caregiver because certain tasks are taken over by the smart living solutions (van de Ven, 2017).

In this paper, we will first go more into depth on how the new tool was constructed. Thereafter, the tool will be analysed and it will be indicated which symptom categories are important for designers of smart living solutions to develop environments that anticipate and adapt to the older adults with early-stage dementia.

### **7.1.3. Methodology**

To construct the tool, first, a literature review was performed, evaluating different rating scales that measure dementia severity and the Diagnostic and Statistical Manual of Mental Disorders (DSM).

First, different rating scales were evaluated to determine which instrument could be used best to describe the progression of dementia and show the different stages of the syndrome in the new tool. The most commonly known rating scales were evaluated (Jung Choi et al., 2016); the Clinical Dementia Rating (CDR), the Global Deterioration Scale (GDS), and the Mini-Mental Status Examination (MMSE) (Folstein, Folstein & Mchugh, 1975; Morris, 1993; Reisberg et al., 1982). These instruments are often used to establish a diagnosis or to determine the stage of the syndrome. The CDR is a well-validated test (Hughes, et al., 1982; Morris, 1993), which is often used by the medical world to get an insight into the different stages of dementia (Jonker et al., 2009). The CDR distinguishes five different stages of dementia: '0' no dementia, '0.5' very mild dementia, '1' mild dementia, '2' moderate dementia and '3' severe dementia (Schmidt, 2014). The MMSE is a shorter standardized test compared to the CDR and is therefore often used by clinicians to perform a first diagnosis (Jonker et al., 2009). The different stages of dementia distinguished by the MMSE can be compared with the five stages of the CDR. However, the MMSE can only provide a poor separation between the stages of '0' no dementia and '0.5' very mild dementia. For this reason, the MMSE can be excluded in the process. The last evaluated instrument is the GDS (Reisberg et al., 1982). This instrument was developed to provide more insight into the various stages of dementia (Belden, Burciu & Sabbagh, 2014). The GDS is not only used for clinical purposes but also provides family and care professionals insight into the course of the syndrome. The GDS describes seven stages of dementia; '1' no cognitive decline, '2' age-associated memory impairment, '3' mild cognitive impairment, '4' mild dementia, '5' moderate dementia, '6' moderately severe dementia and '7' severe dementia. Eventually, the GDS was chosen to serve as a basis for the new tool because it distinguishes more stages than the CDR and MMSE. This differentiation between stages is important because we want to give a complete overview of the different stages of dementia in the tool with a focus on the early stages which are well presented in the GDS compared to the CDR and MMSE. In the result section, the seven stages of dementia according to the GDS will be discussed in more detail.

Hereafter, we looked at the Diagnostic and Statistical Manual of mental disorders, fifth edition (DSM-V) (Task force on DSM-V of the American Psychiatric Association, 2013), to see if this manual could provide the symptom categories for the new tool. The DSM is a classification of mental disorders (Task force on DSM-V of the American Psychiatric Association, 2013). All the disease patterns are described as changes in behaviour or psychological symptoms that affect the individual suffering from the disorder. The manual is used to give more reliable diagnoses by medical personnel. The DSM is developed in over 60 years and is widely used by clinicians and practitioners in the field (Jonker et al., 2009). When we evaluate other instruments like the CDR, then we see that these symptom categories are based on the DSM (Morris, 1993). That is why it was chosen to use the different symptom categories of the DSM-V as a basis for the tool. The DSM-V described six cognitive domains on which dementia has an effect: learning & memory, language, perceptual-motor, social cognition, complex attention and executive functioning.

When constructing the tool including the seven stages of dementia from the GDS and the six symptom categories of the DSM-V we could not incorporate all symptoms of dementia within the tool. That is why a seventh symptom

category was added; 'activities of daily living (ADL)'. Activities that are included in this category are washing, dressing, toileting, mobility inside the home, personal hygiene, and eating. According to Katz, an American physician, and scientist (Wallance, 2007), these activities are necessary to survive in your own home. If you cannot perform these tasks, you are not able to live independently anymore. To test this statement Katz developed the Katz Index of Independence in Activities of Daily living which can be used to evaluate the different task among older adults to test their ability to still live on their own (Katz, 1983). Because we want to offer the designers a complete tool, we have chosen to add this symptom category to the categories of the DSM-V. In this way, the tool can give a complete overview of the symptoms of dementia. The seven symptom categories will be discussed in more detail in the result section.

These seven stages and seven symptom categories eventually formed the basis of the constructed tool. Other scientific and practice-based sources were used to extend the tool like the CDR (Hughes et al., 1982; Morris, 1993), Handbook dementia (Jonker et al., 2009) and An atlas of Alzheimer's disease (Mann, 2001). Different websites from interest groups like Alzheimer Centrum Nederland (Alzheimer Nederland, 2017b) and an American resource centre for dementia caregivers; Dementia Care Central (Dementia care central, 2016) were called upon. Also Gezondheidsplein, a network organization to provide reliable medical information on the internet (Gezondheidsplein, 2018) was consulted. These sources completed the tool as much as possible, some parts are still left blank because no scientific evidence was available.

#### 7.1.4. Results

By combining the DSM-V, the GDS, and other scientific and practice-based sources the tool was constructed (Table 1). In this paper, we present a first version of the tool which designers can use to get a better overview of the symptoms of dementia. In a later stadium, this tool will be extended.

On the first row of the table, the seven different stages of dementia can be found. In the first column, the seven symptom categories are presented. The second column (shown in pink) presents the first stage of the syndrome, 'no cognitive decline', this column represents a mentally healthy person and can be seen as the baseline. The next two stages are pre-dementia stages (shown in lightest grey). Stages 4 and 5 (shown in grey) are the first stages where a diagnosis is established. Stages 6 en 7 (shown in dark grey) are the stages where 24-hour care is needed. People in this stage often live in an inpatient facility. Below the seven stages of dementia are explained in more detail.

- 1) *No cognitive decline*, this stage can be seen as the baseline. This stage represents a mentally healthy person.
- 2) *Very mild cognitive decline*, in this stage people often have subjective complains of memory loss. A person believes that their memory decreased compared with when they were young. They also misplace certain objects more often than usual (Mann, 2001). These complaints are often referred to as age-associated memory impairment (Reisberg et al., 1982). Although there are some indications that people with age-associated memory impairment will develop dementia in the future, no significant correlations are found to support these claims (Mann, 2001).
- 3) *Mild cognitive decline*, also called Mild Cognitive Impairment (MCI), includes all cognitive disorders that are not so severe that they meet the criteria for dementia (Jonker et al., 2009). Approximately 44 percent of the people with MCI will end up being diagnosed with dementia. In this process, the stage of MCI takes approximately five years. The other 56 percent will never develop dementia (Dementie.nl, 2018). It is still not scientifically proven if there is a correlation between MCI and dementia.
- 4) *Moderate cognitive decline*, or mild dementia is the first stage after people are diagnosed with dementia. In this stage, older adults with dementia are still able to live independently. However, some support is needed to perform the more complex household tasks. The mean duration of this stage is two years (Mann, 2001).
- 5) *Moderately severe cognitive decline*, or moderate dementia, in this stage, a person with dementia can no longer survive without assistance from informal and/or professional caregivers. The mean duration of

this stage is one and a half years (Mann, 2001).

- 6) *Severe cognitive decline*, this is stage of moderately severe dementia. In this stage, the ability to perform basic activities of daily life become compromised. People in this stage often move to an inpatient facility. This stage takes approximately two and a half years (Mann, 2001).
- 7) *Very severe cognitive decline*, this is the last stage of dementia. In this stage, an individual needs 24-hour care with basic activities like eating and toileting. The duration of this stage is hard to determine and depends on the physical health of the individual, however, people can still live in this last stage for over ten years (Mann, 2001).

In the rows, the seven different symptom categories are presented based on the DSM-V (Task force on DSM-V of the American Psychiatric Association, 2013) and the Katz Index of Independence in Activities of Daily Living (Katz, 1983) (Table 1). The symptom categories will be explained in more detail below.

- 1) *Learning & memory*. This symptom category includes the degradation of immediate, recent and very-long-term memory (Task force on DSM-V of the American Psychiatric Association, 2013). Immediate memory includes the ability to repeat for example a phone number or an address one just heard. Recent memory can also be seen as your working memory. It exists out of three functions: free recall, cued recall, and recognition memory. Recent memory is very important in complex cognitive tasks such as comprehension, reasoning, and learning (Medicine net, 2013). Very-long-term memory is your autobiographical memory, memories of personal events. It also contains implicit learning memory.
- 2) *Language*. This includes expressive and receptive language. Expressive language contains for example word finding, naming, and grammar. Receptive language is more about difficulties processing language while reading or listening to it.
- 3) *Perceptual-motor*. This category includes all skills people use to interact with their environment. Skills like hand-eye coordination, visuo-constructional (ability to process spatial information) and visual-auditory skills. This also includes praxis; the ability to plan, organize and execute a series of actions, for example, prepare a sandwich or make a cup of coffee. This category also includes the processing of sensory stimuli (gnosis) such as hearing, smelling, tasting and sensing. The perception by the senses is intact, but objects are not recognized.
- 4) *Social cognition*. This category is about how people process information about others. This includes recognition of faces and emotions and social judgment. For example to consider another person's mental state.
- 5) *Complex attention*, consists out of the fields of sustained attention, selective attention, and divided attention. Sustained attention is the maintenance of attention over time, how long a person can concentrate on a particular task. Selective attention is the skill to maintain attention on one particular task while there are other stimuli in the room. For example, reading a book while the television is on. Divided attention is the ability to shift between tasks, for example, driving a car while reading the GPS.
- 6) *Executive function*. The category includes all that has to do with planning, decision making and solving problems. How people find a solution for a certain problem that is presented to them. It becomes harder to shift and connect different scenarios. Also the ability to perform mental calculations decreases.
- 7) *Activities of daily living*. This symptom category includes six activities that a person's needs to be able to execute if they want to live independently (Wallance, 2007). This includes washing, dressing, toileting, mobility inside the home, personal hygiene, and eating. During the process of dementia, a person is

affected in such a way that they often get difficulties with executing these tasks. If you cannot perform these tasks anymore, then the dementia is already in a more advanced stage.

Based on the seven stages and symptom categories the basis of the table was constructed. Hereafter the table was filled-in according to the scientific sources discussed in the methodology. The first time a cell in a row is filled-in indicates that from this stage on the symptom applies. Because dementia is a progressive syndrome, this symptom will not disappear anymore but will, in most cases, become worse as the syndrome progresses. If there is a cell empty in a row after a cell is filled-in than this means that the severity of the symptom remains the same. For example in the second row; concentration deficits, the last box is not filled in. This means that for this stages the symptom is similar to stage 6 'One has difficulty to concentrate in an environment with multiple stimuli'.

If we go more into depth about the meaning of the different stages and symptom categories you can clearly see that not all symptoms develop at the same stage of dementia. Looking at the 2<sup>nd</sup> stage you can see that ability to concentrate (complex attention) and short-term memory loss (learning & memory) are already negatively affected. This corresponds to age-related memory loss. Other symptom categories are not yet affected.

Slowly with the progression of the disease more symptoms negatively affect the older adult with dementia. In stage 3, Mild Cognitive Impairment, the symptom categories of executive functioning and perceptual motor control are affected. Older adults get slight difficulties with executing more difficult tasks like organizing dinner parties and solving difficult problems. Also, people get more difficulties with performing the more complicated household tasks. However there are no problems with daily functioning, people are fully capable of living on their own. Also in the social cognitive category, you can see some problems arising however, this has mainly to do with fear and anxiety for a potential diagnosis. Because at this stage it is still not sure if people will develop dementia.

The 4<sup>th</sup> stage is the first stage where the diagnose is official. In this stage, people are still able to function independently in their own home. You can clearly see that there are no problems with activities of daily living which negatively affect the older adult. All the other symptom categories clearly have an effect on the person in stage 4.

At stage 5 you can clearly see a transition, this is the first stage where all symptoms can be present. People need more help with activities of daily living.

Stage 6 is the stage where major communication problems arise. People have problems with expressive and/or receptive language. They have severe memory loss with short and long-term memory. They are also not able anymore to learn new skills and disorientation is as well time as place occur. 24-hour care is needed for survival.

In the last stage, older adults almost appear to be young children again. People fully retire in themselves. There is hardly any interaction possible between the older adult and the caregivers.

| Stage →<br>Symptom categories<br>↓ | 1. No cognitive decline                         | 2. Very mild cognitive decline (age associated memory impairment) | 3. Mild cognitive decline (MCI)                                                            | 4. Moderate cognitive decline                                                                                           | 5. Moderately severe cognitive decline                                                                                                         | 6. Severe cognitive decline                                                                                                                                                                                                 | 7. Very severe cognitive decline       |
|------------------------------------|-------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Complex attention                  | No concentration deficits.                      | Reduced ability to concentrate (age-related). <sup>7</sup>        | Concentration deficit may be evident on clinical testing. <sup>6 7</sup>                   | Concentration deficit. Attention is better with fewer stimuli (like television or radio). <sup>6 9</sup>                | Cognitive abulity (loss of willpower because a person cannot hold a thought long enough to determine the right course of action). <sup>6</sup> | Has difficulty to concentrate in environments with multiple stimuli. <sup>9</sup>                                                                                                                                           |                                        |
| Executive functioning              | Fully oriented in time.                         |                                                                   | Slight difficulty with time relationships. <sup>2 8</sup>                                  | Moderate difficulty with time relationships (which day of the week or month of the year it is). <sup>2 5 6 7</sup>      | Severe difficulty with time relationships; frequently disorientated in time. Does not know which year it is. <sup>2 6 8</sup>                  | Disoriented in time. Does not know the day of the week or month. <sup>2 6 8</sup>                                                                                                                                           | Disoriented in time. <sup>8</sup>      |
|                                    | Able to maintain day/night rhythm. <sup>1</sup> |                                                                   |                                                                                            | Repetition in daily life is necessary. <sup>3 5</sup>                                                                   | Support needed to maintain day/night rhythm (eating breakfast multiple times, sleeps during the day). <sup>3 5</sup>                           | Day/night rhythm frequently disturbed. <sup>3 6</sup>                                                                                                                                                                       |                                        |
|                                    | Solves everyday problems.                       |                                                                   | Slight impairment in solving problems, similarities, and differences. <sup>2</sup>         | Moderate difficulty in handling problems, similarities, and differences. <sup>2</sup>                                   | Severely impaired in handling problems, similarities, and differences. <sup>2</sup>                                                            | Severely impaired in handling problems, similarities, and differences. <sup>2</sup>                                                                                                                                         | Unable to solve problems. <sup>2</sup> |
|                                    | Able to organise complex events.                |                                                                   | Slight difficulties with organising complex events (like dinner parties). <sup>3 7 8</sup> | Inability to perform complex tasks (person tries to avoid complex tasks and challenging situations). <sup>5 6 7 8</sup> | Avoid complex tasks. Does not take initiative in undertaking activities. <sup>5</sup>                                                          | Avoid complex tasks. Does not undertake activities. Needs help with undertaking activities because otherwise, a person has too much energy. Starts fidgeting, vibrating, moving objects, wandering around. <sup>3 5 7</sup> |                                        |

|                   |                                                            |                                                                      |                                                                                              |                                                                                                                                           |                                                                                                                                          |                                                                                                                                                                           |                                                                                                                                           |
|-------------------|------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Learning & Memory | No memory loss. <sup>2 8</sup>                             | 'Benign' forgetfulness. <sup>2</sup>                                 | Consistent mild forgetfulness or 'benign' forgetfulness. <sup>2 5 8</sup>                    | Moderate memory loss; decreased knowledge of current and recent events. <sup>2 3 5 6 7</sup>                                              | Severe memory loss. Severity of memory disorder changes. <sup>2 6</sup>                                                                  | Severe memory loss. <sup>2</sup>                                                                                                                                          | Severe memory loss; only fragments remain. <sup>2 8</sup>                                                                                 |
|                   | No subjective complaints of memory deficit. <sup>6 2</sup> | Subjective complaints of memory deficit <sup>6 7</sup>               | Slight memory deficit (only noticeable for intimates). <sup>6 7</sup>                        | Moderate memory loss interferes with everyday activities. <sup>2</sup>                                                                    | Severe memory loss; not aware of important current events (like the name of president or weather conditions). <sup>3 7</sup>             |                                                                                                                                                                           |                                                                                                                                           |
|                   | Able to learn new skills.                                  |                                                                      | The patient may read a passage or a book and retain relatively little material. <sup>6</sup> | Difficulties in learning new skills. <sup>3 9</sup>                                                                                       | Only highly learned material retained; new material rapidly lost. <sup>2</sup>                                                           |                                                                                                                                                                           |                                                                                                                                           |
|                   | No long-term memories.                                     |                                                                      |                                                                                              | No problems with long-term memory. Occasionally deficit in memory of one's personal history (forgetting own wedding date). <sup>3 6</sup> | Moderate loss of long-term memory. Unable to recall major events of their own life (like the school of whom one graduated). <sup>6</sup> | Severe loss of long-term memory. Retains some knowledge of past lives but sketchy. No memories of own youth (forgetting place they were born). <sup>6 7</sup>             |                                                                                                                                           |
| Language          | No problems in word finding.                               | Inconsistent problems with word finding (normal aging). <sup>7</sup> | Word finding deficit becomes evident to intimates. <sup>3 6</sup>                            | Word finding deficit becomes harder. People often refer to an object as 'that thing' or point towards the object. <sup>3 9</sup>          | Difficulties in communicating. Hard to express or receive language. <sup>5</sup>                                                         | Significant difficulties with expressive or receptive language. Often uses general phrases like 'that thing'. Answers with yes and no. Uses hand gestures. <sup>5 9</sup> | All verbal abilities are lost over the course of this stage. <sup>6</sup>                                                                 |
|                   | Able to speak on a normal level.                           |                                                                      |                                                                                              | Speaking less fluently, less easy to make conversation. <sup>3 9</sup>                                                                    |                                                                                                                                          | The ability for speech decreases. Stuttering or articulation occurs. Slowly going to mutism. <sup>7 9</sup>                                                               | Often there is no speech at all, only unintelligible utterances and rare language of seemingly forgotten words are used. <sup>3 6 7</sup> |



|                  |                                                                       |  |                                                                                                       |                                                                                                                                                               |                                                                                                                   |                                                                                                                                                         |                                                                      |
|------------------|-----------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Perceptual-motor | Fully oriented in place. <sup>2</sup>                                 |  | Almost fully oriented in place, may get lost when traveling to an unfamiliar location. <sup>2 6</sup> | Slight difficulties with orientation in place. <sup>2 6 9</sup>                                                                                               | Difficulties with orientation in place. <sup>2 6 8</sup>                                                          | Disorientation in place. Not aware of the environment. Can wander around. <sup>3 6</sup>                                                                | No orientation in place. Oriented to the person only. <sup>2 8</sup> |
|                  | Able to orientate themselves in familiar and unfamiliar locations.    |  |                                                                                                       | Sometimes disorientation in unfamiliar locations. Able to travel to familiar locations. May need to rely more on maps. <sup>2 6</sup>                         |                                                                                                                   | Difficulties navigating in familiar environments. Needs travel assistance but occasionally will be able to travel to familiar locations. <sup>6 9</sup> |                                                                      |
|                  | Independent function at usual level. <sup>2</sup>                     |  | Slight impairment in independent functioning in daily life. <sup>2 7 8</sup>                          | Limited in independent functioning in daily life. Help is needed. <sup>2 7</sup>                                                                              | Limited in independent functioning in daily life. Not able to survive without some assistance. <sup>5 6 7 8</sup> | Dependent on others for functioning in daily life. Not able to survive without assistance. <sup>6 7</sup>                                               | Needs content help with daily activities. <sup>7</sup>               |
|                  | Independent function at usual level for household tasks. <sup>2</sup> |  | Slight impairment in performing household tasks. <sup>2</sup>                                         | Mild but definite impairment of function at home; difficult chores are abandoned like groceries, cooking, cleaning. <sup>2 3 7 8</sup>                        | Only able to perform simple household tasks. <sup>2 7 8</sup>                                                     |                                                                                                                                                         | No significant function in the home. <sup>2 8</sup>                  |
|                  | No increased problems with visual perception.                         |  |                                                                                                       | Problems with perception arise. Problems with reading, estimating distance or differentiating colours. Unable to recognize yourself in a mirror. <sup>3</sup> | Decreased visual perception. <sup>5</sup>                                                                         | Decreased visual perception. More confused at dusk, when there are lower levels of light, changing shadows. <sup>9</sup>                                |                                                                      |
| Social cognition | Hobbies and intellectual interests well maintained. <sup>2</sup>      |  | Maintained or slightly less intellectual interests and hobbies. <sup>2 3</sup>                        | Complicated hobbies and intellectual interest are abandoned. <sup>2 8</sup>                                                                                   | Very restricted hobbies and interests. Poorly maintained. <sup>2 8</sup>                                          | Cognitive abulia (loss of willpower). A person cannot carry a thought long enough to determine the deliberate way of acting. <sup>6</sup>               |                                                                      |

|                                                          |  |                                                                                                                           |                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                |                                                                                                   |
|----------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| No objective deficits in social situations. <sup>6</sup> |  | Decreased performance in demanding social settings. <sup>2 3 6 7</sup>                                                    | Able to recognise familiar persons and faces. Social judgment is usually maintained. <sup>2 6</sup>                                                                                                                                                                       | Able to distinguish familiar from unfamiliar persons in their environment. Social judgment usually impaired. Less ability to recognize social cues or read facial expressions decreased empathy. <sup>2 9</sup> | Problems with recognizing people. Confuses different people (like mother and wife). Able to distinguish familiar from unfamiliar persons in their environment. <sup>6 7</sup>                                                                  | Unable to make social judgments. Behaviour clearly out of acceptable social range. <sup>2 9</sup> |
| No decline at the level of social cognition.             |  | Denial begins to manifest in the patient. Can lead to mild/moderate anxiety symptoms or even depression. <sup>3 6 7</sup> | Denial is the dominant defence mechanism. One is aware of his shortcomings, awareness of reduced intellectual capacity is painful for most people. Denial becomes psychological defence mechanism; detachment. Attempts are made to conceal the deficit. <sup>5 6 7</sup> |                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                |                                                                                                   |
| No behaviour and character changes.                      |  |                                                                                                                           | Behaviour and character changes can occur. Increased irritability and self-absorption. Increased extraversion or introversion, decreased inhibition, or subtle or episodic apathy or restlessness. <sup>3 5 9</sup>                                                       | Behaviour and character changes occur, emotional changes can occur. Help is needed to prevent anger and suspicion. <sup>7</sup>                                                                                 | From anxiety, frustration, and shame violent behaviour can arise. Emotional changes. Sometimes these changes in behaviour are neuro-chemical but they are also a psychological reaction to the environment and circumstances. <sup>5 6 7</sup> |                                                                                                   |

|                            |                                         |  |                                                             |                                                                                 |                                                                                                                                       |                                                                                                                                                                                                              |                                                                       |
|----------------------------|-----------------------------------------|--|-------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|                            | Anxiety does not occur                  |  | Anxiety symptoms can arise due to diagnoses. <sup>6 7</sup> | Anxiety due to diagnosis and confusion can cause sleep problems. <sup>3 5</sup> | Anxiety, frustration, agitation arise. Violent behaviour may occur. <sup>5 6 7</sup>                                                  |                                                                                                                                                                                                              |                                                                       |
| Activities of daily living | Fully capable of self-care <sup>2</sup> |  |                                                             | Requires instructions for personal care. Needs prompting. <sup>2</sup>          | Requires assistance with personal care. <sup>2</sup>                                                                                  | Requires assistance with personal care. <sup>2</sup>                                                                                                                                                         | Requires much help with personal care. <sup>2 8</sup>                 |
|                            | Can eat independently                   |  |                                                             |                                                                                 | No assistance required with eating. Support needed for getting food, preparing food and eating rhythm. <sup>6 7</sup>                 | Hard to sit down for meals. Eat with fingers (Praxis, not able to use cutlery). <sup>5</sup>                                                                                                                 | Needs assistance eating. <sup>6</sup>                                 |
|                            | Can dress independently                 |  |                                                             |                                                                                 | Needs help with dressing. Difficulties in choosing the proper clothing to wear (weather conditions, situations). <sup>2 3 5 6 7</sup> | Needs help with dressing (puts clothes over pajama, put their arm in the sleeve, put clothes on in wrong other). Can undress or forget necessary items like glasses, hearing aid, dentures. <sup>3 5 7</sup> |                                                                       |
|                            | Can use the toilet independently        |  |                                                             |                                                                                 | No assistance with toileting necessary. <sup>6</sup>                                                                                  | Help is needed with toilet visits (forget to flush, throw away toilet paper). At the end of this stage often completely incontinent. <sup>3 5 6 7</sup>                                                      | Incontinent of urine. Requires assistance toileting. <sup>2 7 8</sup> |
|                            | Can maintain personal hygiene.          |  |                                                             |                                                                                 | Needs assistance/prompting with personal hygiene (brushing teeth, washing). <sup>2 5</sup>                                            | Needs assistance to carry out personal hygiene and bathing activities. (Often difficult to choose the right water temperature). <sup>3 9</sup>                                                               |                                                                       |

*Table 1. A tool to support the design process of smart living solutions. (This table shows the constructed tool. The tool displays different stages of dementia and the different symptom categories. It can be used by designers to give insight into the syndrome of dementia).*

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  - 3 Gezondheidsplein (2018) Verschillende fasen dementie. Available at:  
<https://www.gezondheidsplein.nl/specials/verschillende-fasen-dementie/item56781> (accessed 20 May. 2018)
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<https://www.dementiacarecentral.com/aboutdementia/facts/stages/> (accessed 4 Jan. 2018).
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#### 7.1.5. Discussion

In relation to the rising number of older adults with dementia, we, as designers, need to look at how we can respond to the social changes which encourage older adults with early-stage dementia to live longer at home. Smart living solutions which are fully integrated into the homes of the older adults can be an answer. To develop these integrated smart living solutions, designers need to know the older adults with dementia. The tool constructed in this paper helps to obtain this knowledge. The tool makes it easier for designers to delve into the complicated disease process of dementia and it provides a clear overview of the different stages and symptoms of the syndrome. The tool constructed in this paper does not aim to be a new diagnostic test or a symptom checklist. It is a tool which designers can use to obtain more information about the needs of older adults with early-stage dementia in a simple way. The knowledge presented by the tool enables designers to develop smart living solutions that take into account the user.

The tool can be used in various ways. Below three examples of how the tool can be used in the design process of smart living solutions will be presented. The tool can be used at the beginning of a design process. A designer can gather the information that older adults often get caught up in unsafe situations, like getting lost when doing groceries. With this information, the designer can set up requirements for the future design process of a smart living solution that can support the older adult in this kind of situations.

As a designer, you can also use the tool if you want to provide solutions for a specific symptom category. For example, you see in the tool that people with dementia have problems with their memory (Table 1), and you decide to tackle this problem by developing a smart living solution. Then you can use the tool to gather more information about the different symptoms that affect a person's memory during the different stages of dementia and you can respond to this with a specialized design. As a designer, you have to be careful because in the tool it is also clearly visible that older adults in the later stages of dementia lose the ability to learn new skills (Table 1). It is thus not possible to make a product which requires learning a new skill for this target audience. The designer should take this information into account when further developing their smart living solution.

A third way in which the tool can be used is if a designer wants to design for a specific target audience. As in this paper, for example, we want to ensure that older adults with early-stage dementia can continue to live at home. To develop smart living solutions that can contribute to the independence of the older adults with early-stage dementia, a designer needs to know how the older adults are affected by the syndrome in the early stages. The

tool can be used to gain this knowledge. From the tool, designers can obtain the information that people in stage 4 are able to live independently however in stage 5 they need more support (Table 1). During stage 5 the ability to independently perform activities of daily living decreases. Actions as eating, washing, and clothing become more complicated. Thus, if we, as designers want to ensure that these people can continue to live independently at home for a longer period of time, then we must pay attention to this symptom category of 'daily living activities'.

Concluding, the tool can be used in different ways. With a more general approach to set-up design criteria or with a more specific target group or solution in mind. The tool can guide the design process and give designers more insights into the needs of older adults with dementia. However the tool is not complete yet, more research needs to be conducted to get a more extended overview of the stages and symptoms of dementia. Other symptom categories can be added, for example, physical limitation due to dementia. In the current tool, it was decided to not include this symptom category because physical degeneration due to of old age is hard to distinguish from the physical decay attributed to dementia. More research needs to be constructed before physical limitation can be addressed as a symptom category on its own.

It is, however, good to take into account that if a certain symptom does not appear in the tool, this does not mean that the designer does not have to take this symptom into account. The tool is an instrument which can support the designer. However, it should not be seen as a checklist. Older adults with dementia are also elderly, who suffer from limitations due to old age. A designer should keep this in mind and adapt their designs to the needs of every older adult. It is also good for designers to keep in mind that dementia is a syndrome which manifests itself differently for each individual (Schmidt, 2014). It will therefore not be the case that someone in stage 3 always suffers from all the symptoms stated in the column of stage 3. It may be that 'social cognitive functioning' is similar to stage three while 'learning & memory' skills are already progressed to stage 4. Thus, designing for particular individuals with dementia will always be custom work, although the tool can offer support.

Another characteristic of the syndrome of dementia which needs to be taken into account is that it is a progressive process. During this process, more symptoms will affect the patient over time. This means that as a designer you need to consider if you want to design a product for a certain short period of the dementia process or a product which can adjust over time. These characteristics, like progressiveness and individualistic process, are a reason for designers to use the tool to look at a particular symptom but to make a connection between the different symptoms, symptom categories, and stages of dementia.

Although more research is needed to complete the tool, we can conclude that the tool presented in this paper is a good start in giving a clear and structured overview of the different stages and symptoms of dementia. It is a simple tool for designers to get more insight into the needs of older adults with early-stage dementia. The information presented can be used by designers to set-up criteria for the design smart living solutions which anticipate and adapt to the user and thereby enable older adults to live longer in their own homes.

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## 7.2. Elderly and the impact of the maintenance cost of their real estate on their potential relocation

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### 7.2.1. Abstract

The article focuses on the question how the maintenance cost of real estate owned by the elderly impact on their satisfaction, quality of living and potential relocation into a suitable accommodation unit. In Slovenia more than 80% of households owned their home and among these more than 60% of owners are over 65 years old. The main instrument for measuring the participants' expectations is a questionnaire in which 471 participants older than 65 years took part. We statistically analysed the results by conducting one-way analysis of variance regarding the participants' different demographic and socio-economic characteristic. By analysing the results of statistical analyses it is evident that Slovene participants according to the maintenance cost expressed statistically significant differences regarding most of their demographic and socio-economic characteristic. The main conclusion is that the participants would not sell their property in any way, nor in return for a better quality living environment. The attachment to the environment where they live is extremely high. They prefer to solve the problems of maintaining rather than moving to a more suitable home or environment. We explain this with a strong social affiliation to the micro environment, strong intergenerational attachment and the reluctance of migration among Slovenians.

**Keywords:** Elderly, Maintenance cost, Real estate, Demographic and socio-economic characteristic, Slovenia

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### 7.2.2. Introduction

Demographers find that two demographic groups are fastest growing: centenarians and young millionaires. According to the Statistical Office of the Republic of Slovenia, Slovenia had only twenty-six centenarians in 1995, and in the first half of 2013 it already has two hundred and twenty-two (Krajnc A., 2013). In Slovenia, the number of elderly people is growing; experts believe that our society is not quite ready for aging and many problems could arise in the process of aging. According to the population projection (SURS, 2017), the proportion of at least 65-year-old people (65+) among the total population is expected to increase by more than 16 percent (to 33.4%) by 2060, or the number of so many old inhabitants is expected to increase from 2008 to 2060 from 325,300 to 589,900. The proportion of at least 80 years old people (80+) among the total population is projected to increase from 3.5 percent to 14.1 percent, or from 71.200, to 249.500 inhabitants. This also affects housing policy.

The aging of the population does not appear to be a process that should be avoided by societies, but as a process that should be understood as a result and consequence of the planned or desired processes, and which also requires the adaptation of social institutions and services (Kerbler, 2011a). One of the responses of society is the idea that older people should be guaranteed the longest stay in their home environment, in which they would be able to live as freely as possible and as high quality as possible. Active aging, a society for all ages and independent living services are concepts that in recent years have been the main themes of research programs and strategic plans in European countries (Kerbler, 2011a).

The vulnerability of older people is also associated with a lack of financial resources. The income deficit makes it impossible for them to live an active life; they cannot afford long-term care and health care, and eventually become more and more dependent on others. Moreover, the lower poverty figures for people aged 65 and over in some Eastern Europe may also be a result of the methodology used to measure the risk of poverty. As mentioned above, the 60 percent poverty threshold is linked to the living standard within the respective national context. This picture is radically different when instead of relative poverty rate one looks at the disposable income (i.e. taking account of the parity of purchasing power). The situation of a relatively well-off older person in one of the Eastern European countries is significantly worse when compared to an older person living on the West, whose purchasing power is more than three times higher than in Eastern Europe (AGE Platform Europe, 2012).

More and more European households, including those of older people, are no longer able to keep their homes adequately warm at reasonable cost. There is a mixture of various factors that can lead to energy poverty, such as: inadequate income, in particular among the most vulnerable people; increasing fuel prices, including the use of relatively expensive fuel sources such as electricity; lack of appropriate home insulation and/or inefficient heating systems; and/or under-occupancy of homes, leading to a higher average surface to be heated (AGE Platform Europe, 2012).

More than half of Slovenian households are faced with overpayments related to housing. Some Slovenian households are financially overburdened, and consequently they are not able to maintain their own housing, which leads to a decline in housing assets (Čosić, 2011).

The article focuses on the question how the maintenance cost of real estate owned by the elderly impact on their satisfaction, quality of living and potential relocation into a suitable accommodation unit. In Slovenia more than 80 percent of households owned their home and among these more than 60 percent of owners are over 65 years old.

### 7.2.3. "Aging in place" and maintenance cost

Gwendolyn A. (2006) states that many retired people have an inner need and desire to be able to make some kind of change in the world. Therefore, the survey involves older participants in order to find out which are the key factors related to the costs of maintaining real estate (maintenance cost) that are statistically significant for them. The World Health Organization has determined that age begins after age 65, which is why we take this age limit in our survey (Majer, 2015).

Ramovš (2013) highlights the risk factors at the social and cultural level: he presented older people as weak and dependent, the erosion of family ties between generations, systems of inheritance and land rights that affect the distribution of power and material goods in the family, the migration of young couples leave their elderly parents themselves, especially in societies where young people have traditionally taken care of the elderly, and the lack of funds to pay for care.

Every neighborhood has its particular sense of place, resulting from its physical structure and its sociological make-up. When new housing developments are built in or adjacent to old neighborhoods, a different sense of place will exist in the new development and in the adjacent old environment, with mutual effects between the two.

Research in psychology suggests that attachments to place grow stronger with age (Zingmark, Norberg, and Sandman, 1995). The immediate neighborhood environment is typically understood to play an increasingly important role in shaping daily life as retirement and mobility limitations diminish the radius of routine activity, although the claim that neighborhood exposures grow more relevant with age has not been directly tested (Cagney and Cornwell, 2010). Older adults also experience comparatively lower rates of residential mobility. In 2000, only 4 percent of adults aged 65 and older changed residences in the past year compared to 15.6 percent of the younger population (Cagney et al., 2013). As older adults age in place, the opportunities and constraints presented by their neighborhood environments become increasingly relevant to health and well-being (He et al., 2005). The findings below are consistent with the claim that neighborhoods are consequential for older adult health, with patterns of influence varying by individual-level factors such as stage in the life course, gender, and race.

Many research suggests that heavy traffic, excessive noise, inadequate lighting, and poor sidewalks may discourage physical activity among older adults (Balfour and Kaplan, 2002; Gallagher et al., 2010; Giles-Corti and Donovan, 2002; Mendes de Leon et al., 2009; Strath, Isaacs and Greenwald, 2007). Older adults may be particularly responsive to specific aspects of the built environment (e.g., walkable sidewalks, curb cuts) since physical limitations are more prevalent; mobility declines or inability to drive may mean that neighborhood conditions favorable to walking become more salient for older adults' healthful living (Clarke, Ailshire and Lantz, 2009).

Living in own home has many positive effects, especially beneficial for the well-being and psycho-physical condition of elderly people. According to Maisel and Others (2008), studies have shown that independent living promotes successful aging by improving health, life satisfaction and increasing the self-esteem of the elderly, which can delay the transition of elderly people to the institutional form of stay.

The relocation of older people is often seen as a traumatic experience (Kerbler, 2011c). They do not even want to think about resettlement. Those who decide to relocate are mostly in the early mature years, because, as we conclude, people are beginning to think about living in the future (re) thinking when retire. At that time, it is also the greatest possibility for relocation with this aging this desire is greatly reduced. This is confirmed by the telephone interview done by Sendi and others (2003). They found that the highest share of those who would relocate in the age structure is 50-55 years (27%), and then with each subsequent age group this percentage is falling. Thus, the share of the elderly from 80 years, who thought about relocation, was only 8 percent. In general, less than a fifth of elderly people in Slovenia thought about relocation (18%). This is especially a problem for people who are old. Sendi and others (2003) have found that people with aging are increasingly seeking to be people of the same age in their vicinity. In urban areas, transport is also a major problem - both the dormant traffic in residential neighbourhoods and traffic in general. Many older people therefore often feel embarrassed in such a more and more transportable environment, they are afraid, they do not know how to react in certain situations, as participants in traffic, and often do not feel good at less favourable weather conditions etc). Older people often become more isolated in their neighbourhoods, more often stay in their own homes and depend on the help of others (transportation, shopping, etc.) regarding the provision of services. The third major problem associated with the elderly living in their own homes is the maintenance costs of the property (including running costs, annual costs - insurance, tax liabilities and the like - and other maintenance costs), especially for those with lower incomes. Grum and Temeljotov Salaj (2016) report that one third of the elderly who are between the ages

of 54 and 60 spend on average about 30 percent of the monthly income for maintaining their home, and those who are over 85 years old are even more than half. In addition, elderly people live mostly in older dwellings, which is due to their unwillingness to relocate. Maintenance costs with the age of real estate are usually growing rapidly, so the owners of older real estate are faced with the risk of rising maintenance costs. Many elderly people, especially those who live alone or in retired households, just barely cover current expenses and annual taxes (compensation for the use of building land, property tax), and for other obligations related to the maintenance of real estate often do not have enough savings, which has a negative impact on the value of the property (Kerbler, 2012).

“Aging in place” was seen as an advantage in terms of a sense of attachment or connection, practical benefits of security and familiarity, and as being related to people’s sense of identity through independence and autonomy. Attachment and connection operated at social and community levels; they were not just linked to a particular house. We were also struck by the pragmatism of people’s conceptions of aging in place, including aspects like attachment to place. In each area, participants gave us a consistent and strong message of what a “warm” place their community is (Wiles, 2011).

#### **7.2.4. Methodology and instruments**

The main instrument for measuring the participants' perceptions is a questionnaire that was formed for previous study (PKP, 2014). In composing the questionnaire we thought the guidelines according to Tarik (1990) and took the questionnaire composed of three sets as the main instrument for measuring participants' perceptions. The first set measures demographic factors, the second one measures socio-economical factors and the third one measure participants' economical factors. We used the method of review based on the questionnaire (Walonic, 2007). Participants responded to questions (most of them) by means of Likert scale, where the value 5 meant that they completely agree with a statement and the value 1 that they completely disagree with a given statement. The data collection was carried out via personal correspondence and internet. The anonymity of participants involved in the survey was ensured. The data was processed with a SPSS statistics system. The questionnaire includes 16 variables, which are shown in Table 1. The reliability of the questionnaire established by the inner consistency method or the Cronbach's alpha coefficient indicates that the questionnaire expresses a high level of reliability. 471 Slovene participants took part in the survey. Statistical description is shown in Table 1.

*Table 1: Statistical description - structure of participants according to demographic, socio-economic and economic characteristic*

| No. | Variable                  | Description              | Percent | continue |                                         |                       |
|-----|---------------------------|--------------------------|---------|----------|-----------------------------------------|-----------------------|
| 1   | gender                    | men                      | 39.70%  | No.      | Variable                                | Description           |
|     |                           | women                    | 60.30%  |          |                                         |                       |
| 2   | age                       | 65 to 70 years           | 33.10%  | 9        | desire type of dwelling to live         | home with relatives   |
|     |                           | 70 to 80 years           | 38.00%  |          |                                         | home alone            |
|     |                           | more than 80 years       | 28.90%  |          |                                         | nursing home (a)      |
| 3   | location                  | in the city              | 52.90%  |          |                                         | nursing home (b)      |
|     |                           | village                  | 33.80%  |          |                                         | other                 |
|     |                           | rural                    | 13.40%  |          |                                         |                       |
| 4   | with whome you live       | with partner             | 42.90%  | 10       | stay at home instead of of nursing home | yes                   |
|     |                           | children (grandchildren) | 14.90%  |          |                                         | no                    |
|     |                           | alone                    | 29.90%  | 11       | home help                               | daily                 |
|     |                           | other                    | 12.30%  |          |                                         | once a week           |
| 5   | type of dwelling          | apartment                | 28.00%  |          |                                         | twice or. more a week |
|     |                           | house                    | 45.60%  |          |                                         | once a month          |
|     |                           | nursing home             | 25.50%  |          |                                         | no help               |
|     |                           | other                    | 0.90%   |          |                                         |                       |
| 6   | ownership                 | owner                    | 60.90%  | 12       | relocation                              | certainly not         |
|     |                           | with relatives           | 9.30%   |          |                                         | no                    |
|     |                           | market rent              | 4.50%   |          |                                         | don't know            |
|     |                           | social rent              | 4.50%   |          |                                         | yes                   |
|     |                           | other                    | 20.80%  |          |                                         | certainly yes         |
| 7   | satisfaction              | not                      | 1.10%   | 13       | problems with maintenance cost          | yes                   |
|     |                           | not very                 | 4.50%   |          |                                         | no                    |
|     |                           | medium                   | 5.50%   |          |                                         |                       |
|     |                           | very                     | 51.00%  |          |                                         |                       |
|     |                           | very much                | 38.00%  |          |                                         |                       |
| 8   | attachmen to neighborhood | not                      | 2.10%   | 14       | sale of real estate                     | certainly not         |
|     |                           | not very                 | 5.10%   |          |                                         | no                    |
|     |                           | medium                   | 5.70%   |          |                                         | don't know            |
|     |                           | very                     | 36.60%  |          |                                         | yes                   |
|     |                           | very much                | 50.50%  |          |                                         | certainly yes         |
|     |                           |                          |         | 15       | intergenerational transmission          | yes                   |
|     |                           |                          |         |          |                                         | no                    |
|     |                           |                          |         |          |                                         | don't know            |
|     |                           |                          |         |          |                                         | never                 |
|     |                           |                          |         | 16       | financial benefit / better care         | yes                   |
|     |                           |                          |         |          |                                         | no                    |

The share of elderly people is greatest in smaller town centers (52%) and on the outskirts of towns. Smaller town centers are more attractive to old people, and more young people move from smaller town centers and rural areas to larger cities. In cities, older people have the choice of several different ways of living, there are several organizations, groups of older people, religious groups and other civil associations to provide support and help to the elderly. In rural areas, however, these options are more limited and vary from place to place. Local transport options are smaller, and transport costs are higher due to longer distances. There are also less rented dwellings, but there are more owner-occupied dwellings than in the city (Rant, 2013). According to the type of dwelling, the majority of the participants reside in the house, and relatively large number of them resides in homes for the elderly. Slovene homes for the elderly are opened and designed as combination for older people with serious health problems who need regular medical care, control and care, and in the second for elderly people who are relatively independent. Ramovš concluded (2013) that from the point of view of material supplies in Slovenia we do not have bad homes for old people (Ramovš, 2003).

Consequently the participants express very highly satisfied with their living conditions. As much as 51.00 percent are satisfied, and 38.00 percent even express very satisfied. Extremely high is expressed satisfaction with the living environment, belonging to the neighbourhood. Most of the participants live with relatives (34.60%). Most of them want to spend their age at home (82.40%) and do not want to move (29.10%). Interestingly, however, 44.20 percent of the participants have not yet settled the ownership transfer of the property to the offspring, with 75.80 percent expressing reprimand that relatives would not care better for them if they had a financial benefit.

### 7.2.5. Results and discussion

We analysed the data by conducting one-way analysis of variance regarding the participants' maintenance problems (see Table 2).

Statistically significant differences ( $p < 0.01$ ) regarding the participants' maintenance problems are shown in participants' age, location of their living, with whom they live, in what type of dwelling they live, satisfaction with dwelling, desired type of dwelling for living, questions of stay at home or go to the home of the elderly, intergenerational transmission and care connected with financial benefit.

*Table 2: Presentation of the results of the analysis of variance regarding maintenance problems according to affiliation to different demographic, socio-economic and economic factors*

| Variable                         |     | Sum<br>Squares | of df | Mean<br>Square | F      | Sig.  |
|----------------------------------|-----|----------------|-------|----------------|--------|-------|
| Gender                           |     | 0.747          | 1     | 0.747          | 3.129  | 0.078 |
| Age                              | **  | 4.456          | 1     | 4.456          | 7.290  | 0.007 |
| Location                         | *** | 5.787          | 1     | 5.787          | 11.660 | 0.001 |
| with whom you live               | **  | 8.438          | 1     | 8.438          | 7.065  | 0.008 |
| type of dwelling                 | *   | 3.509          | 1     | 3.509          | 6.106  | 0.014 |
| ownership                        | **  | 21.823         | 1     | 21.823         | 8.242  | 0.004 |
| satisfaction                     | *   | 3.635          | 1     | 3.635          | 5.485  | 0.020 |
| attachment to the neighborhood   |     | 1.002          | 1     | 1.002          | 1.139  | 0.286 |
| desired type of stay             | **  | 14.469         | 1     | 14.469         | 8.483  | 0.004 |
| stay at home/not in nursing home | *   | 0.775          | 1     | 0.775          | 4.985  | 0.026 |
| home help                        |     | 9.088          | 1     | 9.088          | 3.642  | 0.057 |
| relocation                       |     | 5.154          | 1     | 5.154          | 2.570  | 0.110 |
| sale of real estate              |     | 4.503          | 1     | 4.503          | 2.826  | 0.093 |
| intergenerational transmission   | **  | 6.353          | 1     | 6.353          | 9.456  | 0.002 |
| financial benefit                | **  | 1.482          | 1     | 1.482          | 8.045  | 0.005 |

*Notes: \*difference is statistically significant ( $p < 0.05$ ); \*\*difference is statistically significant ( $p < 0.01$ ); \*\*\*difference is statistically significant ( $p < 0.001$ )*

It is interesting that the participants do not show statistically significant differences in the costs of maintenance according to gender, attachment to the home, readiness to move or even sell their property. In old populations, the age of inheritance increases. Due to the lower mobility of the elderly, the age-old influence on migration is greatly influenced. Older people are less likely to decide on migration. This, however, does not necessarily mean that there is less migration in such populations, because the indirect impact of an aging population on migration can occur (Malačič, 2008). The lack of young people in such populations simply attracts young immigrants from elsewhere.

Our conclusion is that the participants would not sell their property in any way, nor in return for a better quality living environment. The attachment to the environment where they live is extremely high. They prefer to solve the problems of maintaining rather than moving to a more suitable home or environment. We explain this with a strong social affiliation to the micro environment, strong intergenerational attachment and the reluctance of migration among Slovenians. In this regard, the role of social support networks plays an important role, since the latter help the elderly in their everyday life tasks; they can offer both financial and material assistance, as well as emotional support and enable the social integration of the elderly into society. The most important source of social support to older individuals is their family members (partner, children - usually daughter, and others). In this article, however, we would like to emphasize another important source of social support, namely neighborhood ties. The latter are extremely important for individuals who remain independent, that is, they are not institutionalized, nor are they living with any family members. The term community-living elders are often used in literature; therefore, they are individuals who live in a local community (Filipović et al, 2005). A more

detailed analysis of the networks of elderly people in Slovenia (Hlebec 2009) shows the great differences between the networks by sex. In this regard, among the elderly, one network stands out, in which there is a great emphasis on neighborhood support, i.e. a network integrated into the living environment. These neighbors represent an important source of almost all types of support, from socializing (32%), smaller (51%) and greater material support (33%), emotional support (20%) and help in case of illness (32%). The only exception is the financial support that individuals with this type of network first find with friends or children. Neighbors on other networks appear primarily as important providers of smaller material support. This applies to both other types of networks among the elderly, as well as for all types of networks among the elderly (Filipović et al., 2005).

While it is relatively unclear at what ages, what levels of functional ability, or in what ways or why older adults pare down the territory in which they act, the residential neighborhood is assumed to be at the center of range. Here, neighborhood refers to individuals' perceptions of their residential environment. (Yen et. al, 2012)

*Table 3: The average degree of agreement between factors where a statistically significant difference*

| Variables                      |                          | N   | Mean   |
|--------------------------------|--------------------------|-----|--------|
| age                            | 65 to 70 years           | 156 | 1.6795 |
|                                | 70 to 80 years           | 179 | 1.6872 |
|                                | more than 80 years       | 136 | 1.8235 |
| location                       | in the city              | 249 | 1.7992 |
|                                | village                  | 159 | 1.6352 |
|                                | rural                    | 63  | 1.6508 |
| with whom you live             | with partner             | 202 | 1.6881 |
|                                | children (grandchildren) | 70  | 1.7143 |
|                                | alone                    | 141 | 1.6879 |
|                                | other                    | 58  | 1.9483 |
| type of dwelling               | apartment                | 132 | 1.7045 |
|                                | house                    | 215 | 1.6512 |
|                                | nursing home             | 120 | 1.8917 |
|                                | other                    | 4   | 1.3333 |
| ownership                      | owner                    | 287 | 1.6760 |
|                                | with relatives           | 44  | 1.7955 |
|                                | market rent              | 21  | 1.8571 |
|                                | social rent              | 21  | 1.4762 |
|                                | other                    | 98  | 1.8571 |
| satisfaction                   | not                      | 5   | 1.6000 |
|                                | not very                 | 21  | 1.7143 |
|                                | medium                   | 26  | 1.3846 |
|                                | very                     | 240 | 1.7333 |
|                                | very much                | 179 | 1.7654 |
| desired type of stay           | home with relatives      | 163 | 1.8037 |
|                                | home alone               | 92  | 1.6848 |
|                                | nursing home (a)         | 117 | 1.7179 |
|                                | nursing home (b)         | 55  | 1.6727 |
|                                | other                    | 44  | 1.5909 |
| intergenerational transmission | yes                      | 155 | 1.7742 |
|                                | no                       | 208 | 1.7596 |
|                                | don't know               | 88  | 1.5682 |
|                                | never                    | 20  | 1.6500 |
| financial benefit              | yes                      | 114 | 1.6140 |
|                                | no                       | 357 | 1.7612 |

Statistically significant differences regarding the maintenance cost are shown in terms of age, location, with whom participants live, type of dwelling, ownership, satisfaction, desired type of stay, intergenerational transmission and financial benefit.

The comparison surprisingly shows that participants' level of "problems with maintenance cost" decreases with higher age (average accordance level of 65 to 70 years old is 1.67, that of more than 80 years is 1.82).

This indicates the possible social orientation of Slovenia. Care for people in the high security of acquiring either the neighbourhood (neighbours) and mostly relatives. The probability of an intergenerational transfer of ownership of real estate is increasing, and it also transfers concern over maintenance costs. A survey on social networks in Slovenia (Ferligoj et al., 2002) finds that neighbours are important in giving less material support, since in this case they account for almost 17 percent of the social support network. On the other hand, Dremelj (2003) concludes that neighbours do not seem to be very important in providing other types of support, as they do not exceed 10 percent. Particularly negligible is their percentage in the network of financial and emotional support (Dremelj, 2003), which confirms our assumption that relatives are nonetheless those who at a high age take over the burden of real estate maintenance.

The comparison shows that participants' level of "problems with maintenance cost" is lower in those who live in the center (average degree of agreement is 1.79). Participants who live in nursing home expressed the lowest level of maintenance cost problem (average degree of agreement is 1.89) and those, who expressed high level of satisfaction with living conditions also expressed lowest level of maintenance cost problem (average degree of agreement is 1.76). As stated by Kerbler (2011b), one of the good forms of rationalization is the stay of the elderly in their home, with the need to transfer health and social services to the place where elderly people live. Research shows that the elderly want to stay in their home in the same known environment for as long as possible, and they want, as long as possible, to maintain their independence and autonomy for as long as possible. However, there is a problem of maintaining own real estate. Houses are often too large, difficult to access and expensive to maintain, and apartments are inadequate, in blocks without elevators, in difficult accessible locations, communal costs are higher year on year, etc. (Žmahar, 2013). And not surprisingly participants who already made intergenerational transmission expressed lower level of maintenance cost problem (average degree of agreement is 1.77) in comparison to those who still owned the real estate.

Results show that the participants would not sell their property in any way, nor in return for a better quality living environment. The attachment to the environment where they live is extremely high. They prefer to solve the problems of maintaining rather than moving to a more suitable home or environment.

#### **7.2.6. Conclusion**

The article focuses on the question how the maintenance cost of real estate owned by the elderly impact on their satisfaction, quality of living and potential relocation into a suitable accommodation unit. In Slovenia more than 80% of households owned their home and among these more than 60% of owners are over 65 years old. The main instrument for measuring the participants' expectations is a questionnaire in which 471 participants older than 65 years took part. We statistically analysed the results by conducting one-way analysis of variance regarding the participants' different demographic and socio-economic characteristic.

The aging process of the population and the associated problems of ensuring the sustainability of health, social and housing care for older people are becoming an increasing challenge for developed countries, including Slovenia. New strategies for care for the aging population are therefore increasingly directed to the shifting of supply activities to the home environment and thus to extending older people's homes at home, which is also in line with the aspirations and wishes of the elderly. They want to stay for as long as possible in their home, in the same home, living and social environment. (Kerbler, 2013).

Therefore, understanding the dynamic of older adults in their residential neighborhoods is important for social policy and public health programs in an aging Slovenia. Why should aging and frailty researchers' care about the geographical boundarization and its subsequent labeling? The reduction in life-space mobility in the aged may make their frailty status more vulnerable to environmental effects. Advancing our understanding of how place



affects their frailty requires that we advance our discourse on the proper use and meaning of terms (Siordia, 2013).

The elders want to live in an environment where they will feel well, where they can be integrated into society, learn about culture and enjoy life in the community with their neighbors. Many also want active life after retirement, even if they have good health. It is therefore very important to ensure a safe environment for them, as well as to have access to institutions such as, for example, health center, pharmacy, shops, post office, etc. They need an environment where they can live normally as before, and where they will not feel superfluous due to their age. Therefore, the trend of accommodation is becoming more and more prevalent as it is closer to the city, to smaller neighborhoods that are built specifically for the needs of older people, t. j. above the age limit of 55 years. In these neighborhoods they have the opportunity to have contact with their peers and to deal with various activities that keep their young mindset. Given the fact that we live longer, the idea of sheltered neighborhoods for the elderly is a good idea, since it is sometimes necessary to make a demarcation between the elderly and the young (Cropper, 2004).

By analysing the results of statistical analyses it is evident that Slovene participants according to the maintenance cost expressed statistically significant differences regarding most of their demographic and socio-economic characteristic. The main conclusion is that the participants would not sell their property in any way, nor in return for a better quality living environment. The attachment to the environment where they live is extremely high. They prefer to solve the problems of maintaining rather than moving to a more suitable home or environment. We explain this with a strong social affiliation to the micro environment, strong intergenerational attachment and the reluctance of migration among Slovenians. Therefore, understanding the dynamic of older adults in their residential neighbourhoods is important for social policy and public health programs in an aging Slovenia.

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## 8. Managing Real Estate

## 8.1. Brexit impact on the real estate sector.

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### 8.1.1. Abstract

Problem statement : The outcome of the UK's referendum on European union and looming exit negotiations , are affecting both the economy and the real estate sector. Companies will consider reallocation to mainland Europe and north to Dublin, Ireland.

In my article I will focus on real estate sector in London, will Brexit affect it or not. In two different studies prediction are opposing each other. One is suggesting real drop of prices and other is predicting the even outcome, due to continuous immigration and development.

How will mainland profit and will there be a rise of demand in particular cities like Frankfurt, Berlin, Munich, Hamburg and non-German Dublin, Paris, Reykjavík etc. Which are already fast gaining the interest of investors, leading to a significant rise in the volume of transactions. This will have an impact on demand for space, especially in established locations.

Frankfurt am Main will play a main role in vying for companies, as it has a competitive infrastructure and demonstrated that important financial institutions are willing to establish presence there.

The property market has been hurt by slower economic growth and a squeeze on consumers' incomes since the referendum to leave the European Union in 2016. The Royal Institution of Chartered Surveyors said last month that activity remains subdued, and mortgage approvals fell to a three-year low last month. The acceleration in annual house price growth is a little surprising and the lack of supply is likely to be the key factor providing support to house prices said Robert Gardner, chief economist at Nationwide, on a results that show rising in London, UK's real estate sector at the start of 2018.

Rising vacancy rates, falling rents and a decline in investment spending could be possible consequences for the property market in London, if the UK leaves the EU. Market participants have stated that at least the prime segment in London is not expected to continue to grow.

**Keywords:** Brexit, United Kingdom, European Union, Consequence, Law, Real estate, Prices, housing market, Economy

### 8.1.2. Introduction

On 23 June 2016, the United Kingdom (UK) referendum where Brits decided whether Britain should remain in, or leave, the European Union (EU) took place. Surprising result and wining of the leave vote by a 51,89 per cent majority stunned the British public and the major political parties. Cameron saw an in–out referendum as a straightforward fix to internal Conservative Party strife over European integration (Copsey & Haughton 2014). And Vote Leave committee with Boris Johnson and Theresa May could never predict final result as their strategy post-referendum is uncertain. On 29 March 2017, the UK government invoked *Article 50 of the Treaty on the European Union*. Article 50 is a plan for any country wishes to exit the EU. It was created as part of the Treaty of Lisbon - an agreement signed up to by all EU states which became law in 2009. Before treaty, there was no formal mechanism for a country to leave the EU. The UK is thus due to leave the EU at midnight on 30 March 2019 Central European Time. The period for negotiation stated in Article 50 is two years from notification, unless an extension is agreed. Negotiations between the UK and the EU began on 19 June 2017. With EU represented by Commission chief negotiator Michel Barnier, and British Secretary of State for Exiting the European Union David Davis, Chief Negotiator for the United Kingdom Exiting the European Union. European integration is the main concern through out EU politics, accompanied with economical crisis in all aspects, but main focus of articles as seen, real estate sector primarily. The legal and tax implications of Brexit, will depend on whether the UK would remain a member of the European Economic Area (EEA) or any specific agreements reached in the case of a third party status. It will further be important whether market participants will be offered transitional arrangements, so that they can adequately adapt to any changes in the legal and fiscal environment.

The UK's exit negotiations should be followed with attention especially in the following areas that may affect cross-border contractual practice:

- Free movement of labour: impact on cross-border recruitment

Taking into account the importance of immigration as a theme in the referendum, and the need to attract foreign labour in particular businesses, such as finance and agriculture, any developments on cross-border movement of employees will be of relevance. It is now generally assumed that the current free movement of labour will be restricted in the future.

- Contract law: impact of the choice of law, arbitration and jurisdiction clause,
- Company law: freedom of companies and partnerships,
- Privacy: impact of EU data protection regulation,
- Legal aid: competitive advantage through state aid,
- Income tax legislation: implications for property investors and service providers,

Tax Act, deferral options for assets to foreign permanent establishments or tax-neutral processing under the German Transformation Act. However, there are also important EU tax directives, that do not apply to the current EEA countries (Norway, Iceland and Liechtenstein).

- Sales and real estate transfer tax law

In the area of transaction taxes, an important question for real estate enterprises will be whether a corporate reorganisation under the law of an EU/EEA member state in Germany still can be carried out in a land- purchase-tax neutral manner. Also in the area of EU harmonised VAT and in the relation with the UK, no longer existing custom borders, complex changes are expected. This equally concerns existing systems of tax exemptions, delivery destinations and last but not least, the sales tax rates itself.

Following the Brexit referendum, we are facing a 2-3 year period of political and economic turmoil, which could have major implications for the UK real estate market. Nobody can say for sure what will happen, other than that uncertainty and risk have spiked. This is already affecting the *capital market* and the *occupier market*, the two drivers of real estate values. Given the increased risk in both markets, property values will fall. This will not be

apparent immediately in the less liquid and less transparent private markets, but the value of houses has undoubtedly fallen.

In response to the referendum outcome, the Norwegian sovereign fund has adjusted down the estimated value of its UK real estate holdings by 5%. According to the quarterly report of the sovereign fund, the vote to leave the EU has triggered significant movements in financial markets and considerable uncertainty. This will have a negative impact on property values.

In the short term, and in case of most properties, no negative change of profitability is expected.

### **8.1.3. After brexit**

*“80% respondents believe that investment into UK property will decrease as a result of Brexit, but this view is less pessimistic than last year (92%).”*

Ever since the UK pressed the Brexit button, its real estate sector has been overshadowed by uncertainty. In the short term the UK's vote to leave the EU has not had a significant impact on the real estate sector, despite some immediate effects on real estate funds following the referendum outcome. One important reason is the long-term nature of real estate investments and related agreements.

A potential relocation of business activities from the UK to other countries, may however have a significant impact on the demand and supply of property in particular cities, resulting in price movements. For the time being, uncertainty prevails, and this may have consequences for yields and financial reporting. Legal and fiscal implications also depend on future agreements between the UK and the EU, but can to some extent be assessed by analysing current structures and future scenarios.

Since predictions and results don't match up, further screening of the real estate market movements are essential to broaden the big picture on a subject matter. Attached to the housing market in the United Kingdom is around £11 billion in mortgage debt, from which £1 billion belong to lenders from abroad, altogether incorporating one of the most extensive concentrations of financial risks (The Economist, 2016). The total value of Britain's housing stock has passed the £6 trillion mark for the first time after gains of £385 billion in 2015, but post-credit crunch gains continue to favour the south over the north, and unmortgaged home owners and private landlords over homeowners with debt, according to new analysis from real estate adviser, Savills. The relevance of housing in the context of economics is high. The importance of the real estate market in the UK's economy is unparalleled. The £6 trillion of housing stock in the United Kingdom forms maybe the biggest asset class in the world.

### **8.1.4. London**

*“One global investment manager stated: “There's no way London is going to lose its place as the financial capital of Europe.”*

We are undoubtedly beginning to see rents soften, but then we shouldn't be too surprised by that. I think it's a short-term blip, and London will remain strong whatever happens.

The big question mark remains occupational demand, particularly for London offices and in financial services. The extent to which financial institutions will need to base more people in the EU — and less in London — will depend on the course of EU-UK negotiations around issues such as passporting and bank settlement. It is impossible to say right now what proportion of London's office stock that will affect, directly or indirectly, but there is bound to be some negative impact. How significant that is, and how far other positive impacts counteract it, time will tell.

London-focussed property companies have been particularly hard hit as investors appear to believe that Brexit means that London will be less popular as a haven for capital. But less well diversified cities may be hit harder — if any multinationals pull out of regional cities that will have a major impact on employment and property prices. Office lettings under negotiation in the provincial market have been summarily terminated this week and office vacancy will increase as new developments complete without tenants prepared to sign long leases at high rents in uncertain conditions. This will simply be indicative of the economic slowdown already underway.

### 8.1.5. Conclusion

In the short-term, the uncertainty of Brexit is likely to cause a moderate fall in prices. In the long-term it is not clear whether Brexit will really change the fundamental disparity between supply and demand which has led to expensive house prices. But, if anything, it will moderate the rise in house prices. Unsurprisingly, Brexit continues to be a live issue in Europe's property industry, and although it will be at least partly responsible for investment values falling in the UK during 2018, few question London's long-term status.

*"Amid all the Brexit noise, negative political sentiment and pessimistic forecasts, there is some uncertainty but Central London office market fundamentals remain sound in terms of supply," he says. "We are seeing new sources of occupier demand from life sciences and sustained activity from the technology, Media and Telecoms sector which will offset financial sector weakness."* Neil Prime, Head of Central London Markets Head of at JLL.

Like all commodities, real estate prices are driven by supply and demand. Demand will fall, but the good news for investors (albeit bad for builders) is that supply will fall too. There will be a likely slowdown in development as some large schemes will get deferred or switched off. With generally low vacancy rates, rental values may be protected.

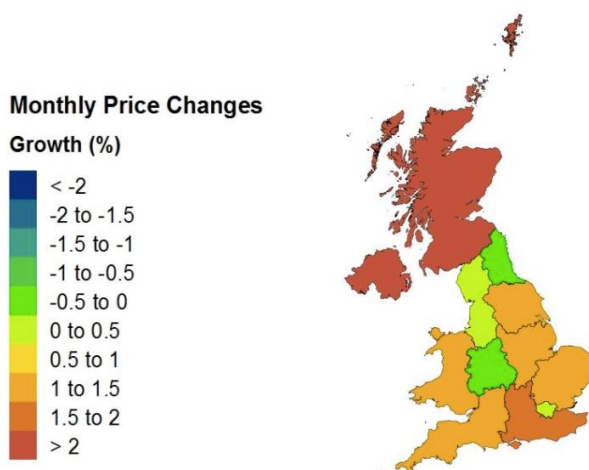
The cheaper pound is good news for some, too. Exports will be cheaper for foreign buyers, so some companies and industries will be positively affected, supporting industrial and warehouse rents. And of course property prices for foreign investors are now lower, so the UK may remain attractive as it becomes cheap compared to other European markets such as Germany. We may see lower interest rates. Some investors clearly see Brexit as a buying opportunity. That is, of course, not much comfort to those property owners who are about to see a good percentage knocked off the value of their balance sheets.

*Graph 1 - UK house price inflation – the potential impact of the Brexit vote, PwC analysis based on ONS house price index, 2017.*

| Year                          | Main scenario | Pre-Brexit scenario | Difference (%) | Cumulative price difference (£) |
|-------------------------------|---------------|---------------------|----------------|---------------------------------|
| 2016                          | 3.1%          | 5.2%                | -2.1%          | -£4,000                         |
| 2017                          | 0.9%          | 5.3%                | -4.4%          | -£13,000                        |
| 2018                          | 4.0%          | 5.6%                | -1.6%          | -£17,000                        |
| <b>Total change (2016-18)</b> | <b>8%</b>     | <b>16%</b>          | <b>-8%</b>     | <b>-£17,000</b>                 |

*Graph 2 - UK House Price Index for December 2017, Land Registry, Gov.uk*





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## 8.2. Investigating (inter)organisational data governance design in maintenance networks: developing a research methodology and crafting data collection methods

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### 8.2.1. Abstract

With information technologies becoming available on a growing scale, capturing large amounts of building information is becoming cheaper and economically viable. This is creating new challenges for real estate management organisations. Producing digital assets is one thing, managing them and knowing how to use them is another. The information management tasks and responsibilities of real estate management organisations therefore are becoming challenging and complex at the same time. Not in the least by the fact that in many situations, maintenance activities are outsourced to contractors and sub-contractors, creating maintenance networks. While building register information may be produced in the first place to fulfil the building owner's needs, this research assumes building registers could also contribute to innovation in the greater maintenance network if the right form of data governance can be implemented. This paper, which is part of a larger research project, presents a research approach for investigating such governance designs for building registers. The approach is based on a qualitative research approach because it aims to address the stakeholders interests adequately and produce findings that are meaningful to all stakeholders for improving data governance in professional practice. Within a multiple case study methodology, an embedded case study design is presented that may provide a useful guide for researchers in this field. The proposed methodology will be used to conduct four in depth case studies. The intended outcome of this research is a theoretical framework that integrates data governance design factors with network innovation effects. It can be used to guide the design of (inter)organisational data governance programmes in maintenance networks.

**Keywords:** Maintenance networks, Data governance, Case studies, Embedded cases

### 8.2.2. Introduction

In recent decades, corrective maintenance as well as preventive maintenance, renovations and fitout projects have been outsourced by building owners on a large scale. Through sub-contracting practices, building maintenance is often carried out by a network of autonomous contractors, subcontractors and service providers that can be viewed as loosely coupled systems (Dubois & Gadde, 2001). In order to plan and execute maintenance activities, these stakeholders rely on information from the building register. A building register contains information about a building and the components out of which it is constructed (Talamo & Bonanomi, 2016). It is the one and only source of reliable information on the building and the elements and systems that are part of it. However, keeping the building register up-to-date throughout a building's life cycle and sharing building register information with stakeholders in the maintenance network is a challenge (Miettinen & Paavola, 2014; Becerik-Gerber, Jazizadeh, Li, & Calis, 2012; Volk, Stengel, & Schultmann, 2014).

Environmental pressures form a driver for innovation in construction networks (e.g. Bossink, 2002). Within maintenance networks, sustainability innovations can lead to the use of new products (e.g. materials, building components), processes (e.g. new application methods) or services (e.g. reverse logistics, recycling related services). However, the nature of building maintenance networks seems to hamper innovation (Dubois & Gadde, 2001). Häkkinen & Belloni (2011) argue that this is not caused by a lack of information, technologies or sustainability assessment methods, but by the fact that stakeholders find it difficult to adopt new ways of working and collaborating. Building register information can potentially play an enabling role in the supply chains for building components for reuse and recycling (e.g. Carra & Magdani, 2017; Lung & Levrat, 2014; Ellen Macarthur Foundation, 2016). Building register information in combination with data analytics can be used to develop new services for smart and sustainable maintenance. However, the value that individual firms assign to building register information may depend on a firm's position and role within the network. There appears to be a need for data governance designs that addresses the interests of all stakeholders and enables the sharing of data (Johannes, Voordijk, & Adriaanse, 2016).

This research explores new ways of collaborating with the building register, focussing on the data governance of the building register. Talamo & Bonanomi (2016) introduce the idea of a 'command centre' as an organisational entity responsible for managing information flows between maintenance supplier and the facility management organisation. In another way, Bosch, Volker, & Koutamanis (2015) also propose an organisational entity for managing information flows. They discuss the 'central data authority' that should operate as a centralized agency for all information supplying maintenance contractors. Both Talamo & Bonanomi (2016) and Bosch et al. (2015) suggest that responsibilities for data governance should be centralized in some way. However, they do not discuss how data governance responsibilities could be allocated or shared among firms and what the relevant factors are that guide these design decisions.

From the brief explanation of the research problem above, the main research question can be formulated as:

*Through what factors can (inter)organisational data governance design of building registers contribute to sustainability innovations in maintenance networks?*

By writing 'inter' between brackets, this research assumes that inter- as well as intraorganisational aspects of data governance could emerge. This question disaggregates into logical sub-questions. The sub questions and their justifications are as follows.

*RQ1: What is the role of building register data for sustainability innovations in maintenance networks?*

Building register information in combination with data analytics can play an enabling role in the development of new services for smart and sustainable maintenance. However, the value that individual firms assign to building register information may depend on a firm's position and role within the network. From the perspectives of the stakeholders within the maintenance network, this research question explores the role of building register information for sustainability innovations in maintenance networks.

*RQ2: What are the effects of (inter)organisational data governance design of building registers on sustainability innovations in maintenance networks?*

Khatri & Brown (2010) define data governance as the allocation of responsibilities for decision making about definition, production, use and retention of data. A data governance design in which decision-making responsibilities are centralized asymmetrically (e.g. within the building owner's organisation) could unwittingly restrict data-reuse and innovation within in the network. When on the other hand, certain decision-making responsibilities are shared to a certain extent among network partners, this could lead to other outcomes.

*RQ3: What factors determine (inter)organisational data governance design for building registers?*

While data governance design has been investigated in corporate settings to some extent (e.g. Khatri & Brown, 2010; Tallon, Ramirez, & Short, 2013; Wende, 2007), research on the allocation of data governance accountabilities and decision rights within building maintenance networks is scarce. This research question aims to identify the factors that determine the allocation of accountabilities and responsibilities. These could be related to ownership of the building or to stakeholder interests, stakeholder goals and power relationships within the network.

*RQ4: How can (inter)organisational data governance of building registers be designed to contribute to sustainability innovations in maintenance networks?*

If the effects of data governance design on sustainability innovations are known, data governance can be designed in a way to stimulate innovation. The findings of the first three sub questions can be used to design (inter)organisational data governance that is tailored to specific ownership situations and maintenance network configurations.

The aim of this research is to generate insights into the design factors for interorganisational data governance of building registers. The intended outcome of this research is a framework that integrates governance design factors with maintenance network innovation and that can guide the design of interorganisational data governance programmes aimed at data sharing and sustainable innovation. As will be discussed in section 2 of this paper, Eisenhardt's approach for theory building (1989) will be adopted for this purpose. The remainder of this paper is structured according to the eight steps of this approach. In section two, Eisenhardt's approach is discussed and the a-priori theoretical constructs are presented together with the research questions (Step 1). The case selection strategy (Step 2) is also described in this section. Section three describes the interview guides that are used along with other data collection methods (Step 3), while section four deals with respondent sampling procedures and data analysis (Steps 4 and 5). While this research is work in progress, steps 6, 7 and 8 will only be touched briefly in this section. The measures for ensuring the reliability and validity of this research are discussed in section five. The last section finally, presents some reflections and conclusions about the presented research methodology and gives a brief account of the current status and the prospects of the research.

### **8.2.3. Research design: a multiple embedded case study design**

Data governance design of building registers cannot be investigated in isolation from its business context. The researcher cannot manipulate the process by which accountabilities and responsibilities for data governance are allocated and then analyse the effects on sustainable innovation in the network. Data governance is a contemporary phenomenon which is actually taking place as stakeholders try to understand it. As discussed by Yin (2014), Cavaye (1996) and Darke, Shanks, & Broadbent (1998), case studies are very well suited to study contemporary phenomena in their real-life context. Action research, where the researcher intervenes in an organisation, can also be an adequate strategy. However, because theory development is the aim of this research and not the implementation of data governance, this research project uses case studies.

The use of case study research as a means for theory development has been discussed in the literature by Eisenhardt (1989, 1991) and Eisenhardt & Graebner (2007). Eisenhardt (1989) has developed a roadmap for executing theory building research with multiple cases (Table 1).

The first step in Eisenhardt's approach ('Getting started') involves the formulating of a research question and the identification of a-priori theoretical constructs. The research questions for this research have been formulated in the first section of this paper. The a-priori theoretical constructs and the sub research questions are shown in Figure 1. In this research, three important theoretical constructs are 'Building ownership', '(Inter)organisational data governance design of building registers' and 'Sustainability innovations in maintenance networks'. The a-priori understanding of these theoretical constructs comes from the literature. However, it is important as the research proceeds, to keep an open mind towards the data, patterns in the data and what is happening in the case (Eisenhardt, 1989), while none of the a-priori constructs is guaranteed a place in the final theory to be developed.

|   | Step                               | Activity                                                                                                                                               | Reason                                                                                                                                                                                   |
|---|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Getting started                    | Definition of research question<br>Possibly a-priori constructs<br>Neither theory nor hypothesis                                                       | Focuses efforts<br>Provides better grounding of construct measures<br>Retains theoretical flexibility                                                                                    |
| 2 | Selecting cases                    | Specified population<br>Theoretical, not random, sampling                                                                                              | Constrains extraneous variation and sharpens external validity<br>Focuses efforts on theoretically useful cases (those that replicate or extend theory by filling conceptual categories) |
| 3 | Crafting instruments and protocols | Multiple data collection methods<br>Qualitative and quantitative data combined<br>Multiple investigators                                               | Strengthens grounding of theory by triangulation of evidence<br>Synergistic view of evidence<br>Fosters divergent perspectives and strengthens grounding                                 |
| 4 | Entering the field                 | Overlap data collection and analysis, including field notes<br>Flexible and opportunistic data collection methods                                      | Speeds analysis and reveals helpful adjustments to data collection<br>Allows investigators to take advantage of emergent themes and unique case features                                 |
| 5 | Analysing data                     | Within-case analysis<br>Cross-case pattern search using divergent techniques                                                                           | Gains familiarity with data and preliminary theory generation<br>Forces investigators to look beyond initial impressions and see evidence thru multiple lenses                           |
| 6 | Shaping hypotheses                 | Iterative tabulation of evidence for each construct<br>Replication, not sampling, logic across cases<br>Search evidence for 'why' behind relationships | Sharpens construct definition, validity and measurability<br>Confirms, extends, and sharpens theory                                                                                      |
| 7 | Unfolding literature               | Comparison with conflicting literature<br>Comparison with similar literature                                                                           | Builds internal validity, raises theoretical level, sharpens construct definitions<br>Sharpens generalizability, improves construct definition, and raises theoretical level             |
| 8 | Reaching closure                   | Theoretical saturation when possible                                                                                                                   | Ends process when marginal improvement becomes small                                                                                                                                     |

Table 1. Process of building theory from case study research (Eisenhardt, 1989)

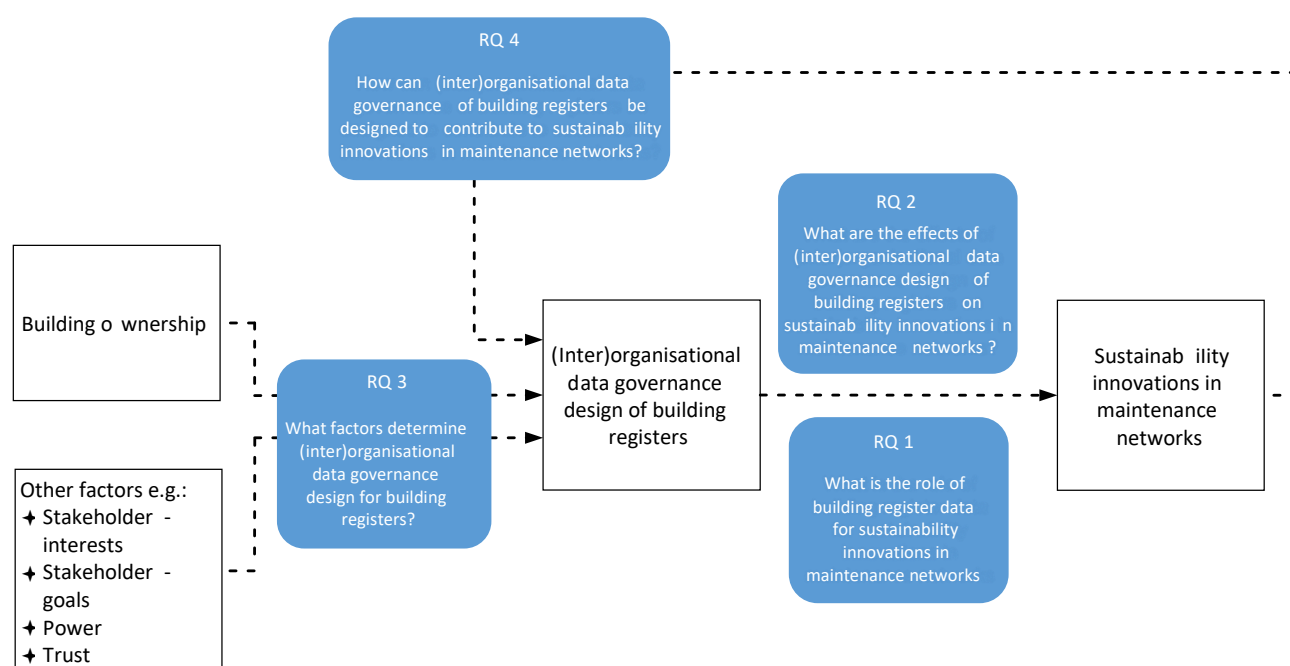


Figure 1. A-priori theoretical constructs

In the second step in Eisenhardt's approach ('Selecting cases'), cases are strategically selected. One of the strengths of the inductive approach suggested by Eisenhardt is that it enables generating of novel theories in new topic area's (Eisenhardt, 1989). It allows for the use of multiple cases that are theoretically sampled, meaning that cases are strategically selected based on their appropriateness in clarifying or extending relationships and logic among constructs (Eisenhardt & Graebner, 2007). Compared to single-case studies, multiple case studies provide a stronger base for theory building (Yin,

2014). The theory can be more robust because the propositions originate from varied empirical evidence (Eisenhardt, 1991). In this research, cases are selected for the purpose of illuminating relationships between dimensions of 'Building ownership', '(Inter)organisational data governance design of building registers' and 'Sustainability innovation in maintenance networks'. Eisenhardt & Graebner (2007) propose "polar types" as an important theoretical sampling approach. This however requires an in-depth knowledge and familiarity with each case which cannot always be realised. We cannot always know before the start of the study, whether a maintenance network is high or low performing on sustainable innovation.

Seawright & Gerring (2008) discuss seven case selection techniques for small-N research, each of which facilitates a different strategy for within-case analysis. According to Seawright & Gerring (2008) case selection has two objectives: the identification of a representative sample and useful variation on the dimensions of theoretical interest. In this research, the primary dimension of theoretical interest is building ownership. It may be expected that in maintenance networks governed by occupier-owner organisations, allocation of decision rights may proceed according to other mechanisms than in maintenance networks governed by investor-owner organisations while interests and goals of both type of owner organisations may be different.

While some design factors for (inter)organisational governance may be related to the owner organisation, other factors may be related to a specific maintenance network. Therefore, the research design makes use of embedded cases as described by Yin (2014). When using embedded cases, two units of analysis are identified on two levels: on the level of the overall case (in this research: the owner organisation) and on the level of the embedded case (in this research: the maintenance network). The level of the owner organisation provides the context for the analysis of the maintenance network. The former is a higher-level unit compared to the latter.

Within one owner organisation, several maintenance networks can be in operation at the same time, independent from each other. Figure 2 shows how four planned cases are positioned in relation to the primary dimension of theoretical interest. Two types of owner organisations are distinguished: occupier-owner organisations and investor-owner organisations.

For both type of owner organisations, two maintenance networks will be selected, according to the demarcation of maintenance responsibilities for building components. An embedded case study design allows the research to examine specific phenomena in operational detail (Yin, 2014). One of the weaknesses of embedded designs according to Yin (2014) occurs when there is too much focus on analysing the subunits without analysis on the higher level of analysis. In this research however, the analysis on the level of owner organisation will support the making of inferences drawn from the two investigated maintenance networks through cross-case analyses (discussed in section four of this paper).

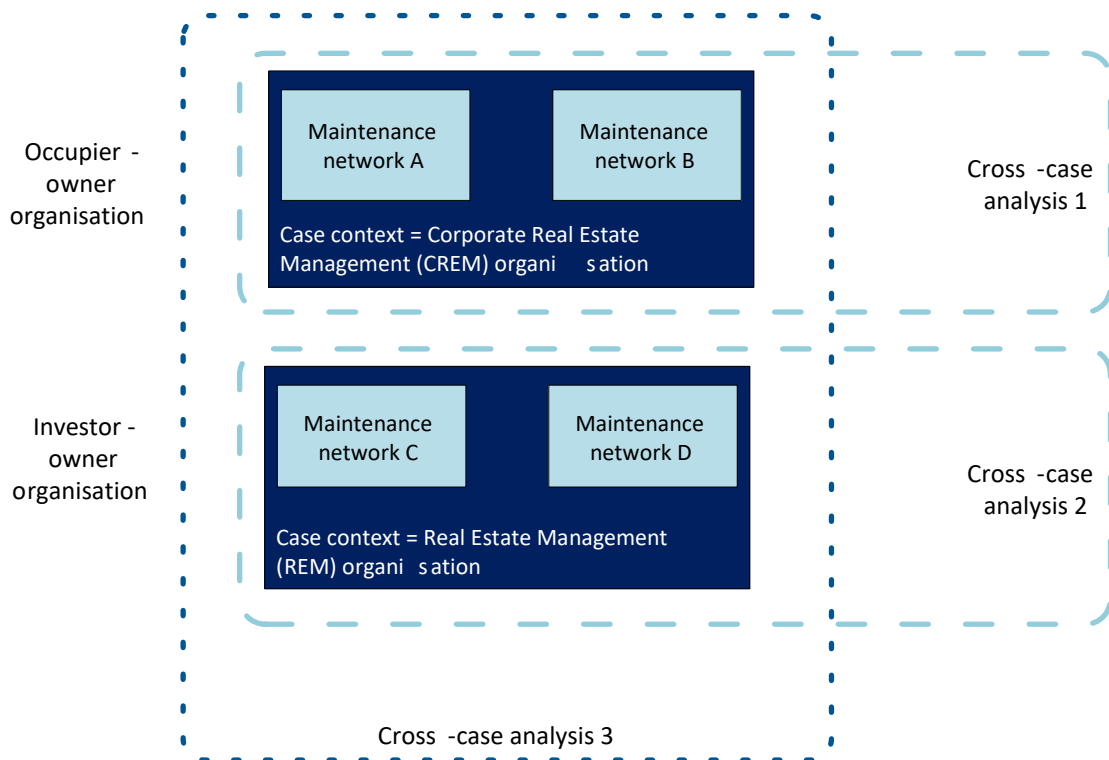


Figure 2. Sampling plan for (embedded) case selection

#### 8.2.4. Data collection methods and design of research instruments

The third step of Eisenhardt's (1989) approach ('Crafting instruments and protocols') deals with choosing data collection methods and designing research instruments. In this research the two main data collection methods are interviews and documentation. The theory to be developed should incorporate the interests, views and behaviours of different stakeholders on both the level of the owner organisation and the level of the maintenance network. In order to build a theory that addresses the perceptions, attitudes and meanings of stakeholders on the data governance of the building register, interviews will be an important data collection method. The second source of evidence is case-specific documentation. Table 2 shows the type of documents that will be used for corroborating the evidence found in the interview data and field notes of the researcher.

Related to interviews as a means of eliciting data from individual respondents, Fontana & Fry (1994) distinguish structured from unstructured interviews. Their discussion of unstructured interviews seems for a great deal related to ethnographic research practices. In this research, a semi-structured format is used as described by

Bryman (2014). This format allows fairly specific topics to be covered, but the interviewees are relatively free and unrestricted in their responses. It facilitates a conversational interview with the possibilities to explore a number of topics in rich detail. Although interview guides are used in following a consistent line of inquiry, the actual stream of questioning will likely to be fluid. Probes and prompts will be used to ask for additional explanation and to check the veracity of statements. Two interview guides are developed, aimed at different respondent groups. They are informed by literature and discussed below.

| Owner organisation level                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Formal study and evaluation reports on the (C)REM organisation and the building register<br>Internal notes and memoranda related to the (C)REM organisation and the building register<br>Case related public news clippings related to the (C)REM organisation and the building register |
| Maintenance network level                                                                                                                                                                                                                                                                |
| Contract documents maintenance contractors<br>Agenda's and minutes monthly contract administrator's meetings<br>Agenda's and minutes quarterly contract managers meetings<br>Agenda's and minutes yearly contract managers meetings Maintenance policy plans                             |

*Table 2. Case documentation on both levels of analysis*

#### **Interview guide for managers (Interview guide A)**

This interview guide facilitates the conversation on the constructs 'building ownership' and 'data governance design in maintenance networks' as well as the relations between them. The aim is to look into the different dimensions in which ownership rights are exercised and how these dimensions are related to the design of data governance. The motives for organisations to acquire the ownership of buildings can be diverse. On the one hand, building ownership can be obtained with the purpose of generating a return on investment. On the other hand, building ownership can be obtained primarily for non-financial reasons to facilitate a business process, to accommodate an organisation or a policy or to accommodate an urban development process. Depending on the motives of building owners, ownership rights can be exercised in different ways. Bon (1994) and Haynes, Nunnington, & Eccles (2017) distinguish three dimensions in which ownership can be exercised: the financial asset dimension, the operational asset dimension and the physical asset dimension. The financial asset dimension of building ownership relates to the economic value of buildings as represented on an organisations accounts balance sheet. The operational asset dimension of building ownership relates to the business use and the business value that a building, facility or the space in a building represents for the owner. The physical asset dimension relates to the building as a material artefact. It relates to the provision of land and a physical construction in which business operations can be performed. The interview guide allows for in depth conversations on all the case study questions identified. It will be used for semi-structured interviews with managers and professionals of (corporate) real estate departments and facility management departments. Besides topics on building ownership, the interview guide will contain topics that explore the nature of the maintenance network. Topics about the (inter)organisational data governance of the building register will also be included.

#### **Interview guide for maintenance staff (Interview guide B)**

Building register users in the context of this research are individuals, in their day-to-day work involved in the planning executing and supervising building maintenance in the case under investigation. They can be employed by a (corporate) real estate management department, a property management agency, a facility management department, a maintenance (sub)contractor or a supplier. The interview guide for building register users facilitates the conversation on sustainable maintenance practices, their data requirements, drivers and barriers for data sharing, and (inter)organisational data governance.



### **Data collection protocol, selection of respondents and data analysis**

When entering the field (approach Eisenhardt (1989), step 4 (Table 1)), individual face-to-face interviews will be held with respondents in different roles from different stakeholders involved: client (or building owner), maintenance contractor and manufacturer. The organisational context in which this research examines data governance forms the narrative environment in which the respondents are interviewed. Narrative environments feed personal accounts of individuals that are part of the environment (Gubrium & Holstein, 2014). The individual accounts of respondents about data governance are informed by the social forces and cultural frameworks that they encounter. Both intra- and inter-organisational dimensions of these social forces and cultural frameworks can be identified.

On the level of the embedded cases, within the maintenance networks, autonomous businesses (maintenance department (of client system), main-contractor and sub-contractor) are contractually connected on the one hand, but also subject to different social and cultural frameworks on the other hand. So, there is reason to believe that these differences will inform and shape the experiences of individuals with data governance of the building register. Therefore, this research will select respondents from main-contractors as well as sub-contractors. On the level of the owner organisation, within the organisation, the experiences of individuals with data governance of the building register will be informed and shaped by the different roles that have to be fulfilled within separate business units, teams and corporate departments.

In order to make sure that the interview data gives an accurate account of the respondent's voice on the research topic, this research defines the subject positions behind the respondents, which can be difficult if respondents can adopt different positions or when they are not aware of the different positions involved. Shifts in subject positions of respondents is often ignored in interview research (Gubrium & Holstein, 2014) and can lead to problems with generalisation. Facility management organisations for example, can vary from very small teams to large multi-department organisations. In small teams, one individual can be responsible for several tasks whereas in large facility management organisations, those tasks would be given to separate individuals. A title or job description does not always provide the right information about the subject position a respondent will adopt. In order to compare the interview results of different cases and to enable cross-case analysis of interview results, specific subject positions within the units of analysis are identified (Table 3). On the level of the maintenance network, building register user respondents (e.g. site handy man, facility location operator, maintenance planner, maintenance engineer, maintenance mechanic) will be sampled from all network stakeholders.

The fifth step of Eisenhardt's approach (Table 1: 'Analysing data') deals with analysing the collected data from the cases. In this research, the expected number of interviews needed for each maintenance network will lie between 12 and 22. The expected number of interviews on the level of the owner organisation is 7. From the case informants through snowballing suitable interview participants will be identified and contacted. In recruiting the participants for the interviews, the stakeholder organisations will be asked for assistance. All interviews will be recorded, transcribed and sent to the interviewees for comments. The data collected in the interviews will be analysed using NVivo. A thematic analysis of transcript data will be conducted to identify important themes, using a hierarchical data coding process. In this way, key constructs and variables for the theory to develop will be identified. In analysing data, the analysis is not only directed to the individual case but also to the cross-examination of cases as discussed below.

| Level of analysis   | Subject positions                    | Research Instrument | Number of respondents per case |
|---------------------|--------------------------------------|---------------------|--------------------------------|
| Owner organisation  | Investor                             | Interview guide A   | 1                              |
|                     | Corporate Real Estate Management     | Interview guide A   | 1                              |
|                     | Real Estate Management               | Interview guide A   | 1                              |
|                     | Property management                  | Interview guide A   | 1                              |
|                     | Facility management                  | Interview guide A   | 1                              |
|                     | Maintenance management               | Interview guide A   | 1                              |
|                     | Corporate Data Governance            | Interview guide A   | 1                              |
| Maintenance network | Contract management (client)         | Interview guide A   | 2                              |
|                     | Contract management (contractor)     | Interview guide A   | 1-2                            |
|                     | Contract management (sub-contractor) | Interview guide A   | 2-4                            |
|                     | Building register users              | Interview guide B   | 5-10                           |

Table 3. Data collection protocol

#### Cross-case analysis 1: occupier-owner organisation (as shown in Figure 2)

In the case selected on occupier-ownership, the context for the maintenance networks is provided by the occupier-owner organisation. Occupier-owner organisations own buildings for their own business use. In the real estate literature, this context is referred to as Corporate Real Estate Management (CREM) (Dewulf, Krumm, & De Jonge, 2000). As Yin (2014) discusses, questions can be asked to find patterns across multiple cases. The purpose of cross-case analysis 1 is to find patterns in the investigated data governance designs for both maintenance networks that can be traced back to occupier-ownership. The major question (related to main research question RQ3) that will be used to guide cross-case analysis

1 is:

- What characteristics of occupier-owner organisations are relevant for designing (inter)organisational data governance of building registers?

#### Cross-case analysis 2: investor-owner organisation (as shown in Figure 2)

In the case selected on investor-ownership, the context for the maintenance networks is provided by the real estate management organisation that invests in real estate with the purpose of generating income from it (Dewulf, Krumm, & De Jonge, 2000). The purpose of cross-case analysis 2 is to find patterns in the investigated data governance designs for both maintenance networks that can be traced back to investor-ownership. The major question (related to main research question RQ3) that will be used to guide cross-case analysis 2 is:

- What characteristics of investor-owner organisations are relevant for designing (inter)organisational data governance of building registers?

#### Cross-case analysis 3 (as shown in Figure 2)

This analysis is aimed at interpreting the findings of cases from the primary theoretical perspective: ownership. The case study results will be interpreted using different theories (e.g. stewardship theory, agency theory, property rights theory) to answer the following questions (related to main research question RQ4):

- What design factors for (inter)organisational data governance of the building register are caused by occupier-ownership characteristics?
- What design factors for (inter)organisational data governance of the building register are caused by investor-ownership characteristics?

During the sixth step ('Shaping hypotheses') of the 8-step-roadmap of Eisenhardt (1989), the focus is on finding evidence for causal relations between the theoretical constructs that have emerged from data analysis. Hypotheses about causal relations between data governance design factors and their effects on sustainability innovations in maintenance networks will be formulated. In step seven

('Enfolding literature') the hypotheses about the emerging theory will be compared with other research on inter and intraorganisational data governance in networks. Other research both with conflicting and similar findings will be used to deepen the insights on the generalisability and limitations of the emerging theoretical framework. On reaching closure (Step 8), Eisenhardt (1989) argues that ideally, the number of cases is determined by the point of theoretical saturation (when incremental learning from adding cases has dropped to a minimum level). In practice however, the number of cases is often determined by pragmatic considerations about available time and money. In this research, it is expected that four strategically selected cases will generate enough evidence for grounding the theory.

### **8.2.5. Validity and reliability**

Threats to validity and reliability of research arise when constructs are interpreted in different ways by the researcher and the respondents (Runeson & Host, 2007). Therefore, the validity and reliability threats will be discussed with the proposed countermeasures. As Yin (2014) argues, the quality of case study research is established by four tests that will be discussed below.

#### **Construct validity**

Construct validity refers to the identification of the correct operational variables for the concepts being studied (Yin, 2014; Gibbert, Ruigrok, & Wicki, 2008). This research studies building ownership, data governance, sustainability innovations and their relationships. In order to enhance construct validity, a combination of tactics is used. First, data triangulation is used to collect data from several sources. Data will be collected from documents, interviews with (senior) managers from different stakeholders and from users of the building register. Second, the research instruments (the interview guides are discussed in section 4) will be tested on a representative group of professionals. Third, draft versions of case study reports will be discussed with participants and key informants on both levels of analysis within the cases.

#### **Internal validity**

Internal validity refers to the way causal relations are examined. Internal validity in particular is important in experimental and quasi-experimental research that aims to investigate causal relationships between a dependent and independent variable (Yin, 2014; Gibbert et al., 2008). As Yin (2014) argues, for case study research in general, internal validity refers to making inferences about situations or events that cannot be observed directly. In this research several tactics are used in meeting internal validity. First, by data triangulation, multiple sources of evidence collected on two levels of analysis (owner organisation and maintenance network) will be combined to reduce the risks of making incorrect inferences. Second, theory triangulation will be adopted when interpreting the interview data from different theoretical perspectives to support pattern matching and explanation building.

#### **External validity**

External validity relates to the way case study findings can be generalised beyond the specific case that generated the findings. It is based on the idea that a theory should be able to account for phenomena in other settings than the setting that was used to develop it (e.g. Yin, 2014; Gibbert et al., 2008). Through its multiple case design, this research establishes external validity through replication logic. By making use of multiple cases (two cases based on occupier-ownership and two on investorownership) that are expected to deliver similar results literal replication is realized. Conclusions that are common to both cases within the same type of owner organisation (occupier-ownership / investorownership) can be generalised to a larger group of similar contracted maintenance

networks for that type of owner organisation. Theoretical replication is realized by selecting two groups of embedded cases that are expected to deliver contrasting results for anticipatable reasons related to differences in ownership.

#### **8.2.6. Reliability**

Reliability deals with minimizing errors and biases in conducting research (Yin, 2014). A research is reliable when subsequent researchers would arrive at the same findings and insights if they would conduct the research along the same steps (Yin, 2014; Denzin & Lincoln, 1994; Gibbert et al., 2008). In this research a case study protocol is used in which all the research instruments, procedures, data analysis methods are documented. Furthermore, a case study data base will be used to store all field notes, case-documents and interview transcripts.

#### **8.2.7. Conclusion**

Case study research is proposed as an appropriate methodology for research into (inter)organisational data governance design in maintenance networks. It is particularly suited to investigate processes through which accountabilities and responsibilities for data governance are allocated in real life contexts. The concept of embedded cases is used to distinguish two levels of analysis: the level of the owner organisation and the level of the maintenance network. Depending on the size and scope of the owner organisation and the real estate portfolio, within one owner organisation several maintenance networks can be in operation at the same time independent from each other. The research design of a multiple embedded case study design in this paper is used for theory building purposes. A theoretical framework will be developed that integrates governance design factors with maintenance network innovation characteristics. Following the 8-step-roadmap developed by Eisenhardt, the research has currently arrived at the fourth step: entering the field. The first two maintenance networks, of the same occupier-owner organisation are under investigation. Based on the findings and field experiences, if necessary, adjustments will be made to the interview guides and document analysis procedures. Even so, if necessary, data collection methods will be added. The aim is to investigate two other maintenance networks within one investor-owner organisation over the course of the next 18 months.

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### 8.3. Valuation system for Heritage Buildings and Buildings in the City Center

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#### 8.3.1. Abstract

Existing building (EB) as a system and part of whole system is cause expansion knowledge, which we need to valuation HB or BCC. In many reasons, this building it should not be the subject of capital, therefore, of supply and demand. Valuation of HB or BCC needs attention to understanding difference between buildings even if they standing in the same street or part of city. For this, involve so many thinks, for example intangible heritage, position on the street, sun expose, etc. How get enough knowledge to help valuation HB or BCC? Background of real estate value of culture heritage buildings (HB) or buildings in City center (BCC) arise from system, which include so many properties. First, interest understands building as a system with materials, infrastructures, details, intangible cultural heritage that impact on details in buildings. Second, HB or BCC are so important to understand our history, and they are like books that content history of knowledge of engineering and arts. Third, properties, which involved to real estate value, but do not come out from buildings, like traffic, sun expose, distance between social buildings (hospital, BUS station, Railway station, noise, air pollution, etc.). HB or BCC is part of higher/bigger system. Real estate represent in many reasons interdisciplinary polygon, and is part of the completely global system. The answer on interdisciplinary and system polygon is the big database. The goal of database is be a simpler and faster way to gain knowledge about the object and wider system. Information technology allow collect wider range of information faster and better than in the past and at the same time, that the same information's change into the necessary knowledge. The paper shows valuation system for HB and BCC.

**Keywords:** Real estate value, Heritage building, Building in city center, System, Ontology, Knowledge management

### 8.3.2. Introduction

Backgrounds of real estate value of culture heritage Buildings (HB) or buildings in City center (BCC) arise from system, which include so many properties.

Existing buildings (EB) as a system and part of whole system cause expansion knowledge which we need to valuation HB or BCC. In many reasons this buildings should not be the subject of capital, therefore, of supply and demand. Valuation of HB or BCC needs attention to understanding difference between buildings even if they standing in the same street or part of city. How get enough knowledge to help valuation HB or BCC? What is the point of valuation? Is it only interest between sellers and buyers? What is interest in wider system for example municipally, neighborhoods, nearest owner? Is it only capital determines value of facilities?

At the most basic level, the value is created and maintained by the interaction of four factors that are related to each product, service, or commodity. These are usefulness, rarity, desire and purchasing power. The value theory is essentially a theory of allocating rare goods and not a lever for determining the (market) price (Fankhauser, in drugi, 2014). The value of building land (indirectly) is reflected in the city rent, as it was perceived by von Thünen (in German: Lagerente) (Drozd, in drugi, 1996). Based on this theory, the higher urban annuity is supposed to be due to the higher value of building land. This means that the location - the position of the land determines its purpose and its potential value. The concept of a position is not an independent category, but something is concerned, for example, per activity or point, which is expressed in terms of availability, availability, proximity. It is also important to distinguish between the position of elements of a system (eg housing within a residential neighborhood) or another system (the position of housing objects in relation to green areas). Below concepts of position and accessibility is the notion of distance - distance, which is the expression of spatial category. However, this is not the only category that affects the value of the land. There is also the quality of space, the geographical location of space, accessibility, ordering, utility equipment, social structure, location of activities, that is, the overall structure of the city (Dvornik Perhavec, 2010).

The discovery of the dynamics of urban renewal and revitalization is not a new phenomenon (Rotar, 1981) (Verlič-Dekleva, 1990) (Jakhel, 1979) but in this case the theoretical question of defining the value of buildings according to this process was ignored. In the last twenty-five years, geographical economics has discovered two seemingly paradoxical paradigms that analyze the decline and value growth of buildings, especially in the light of rapid changes in the advanced environment (Christensen, 1999). The first is the "rent gap", which reflects the difference between the actual and the possible yield of a site, a building according to its utilization, and a quality in free market conditions (Smith, 1990). (Hamnett, 1999). This possible use should largely reflect the value of a building, whether residential or commercial. The second is the "value gap", which reflects the difference between the value of the building at the defined function of its purpose and the protection of its users and the same building, if these measures would not exist, thus empty (Hamnett, 1999). The first concept developed in the United States, the second one in Europe.

Both terms accurately disclose the gap in the value of the reasons for the use of the building in relation to changes in the market environment. This analysis reveals new possibilities for defining the relationship between the market and planning, the general and economic interests of the environment and its users. Physical interventions in the environment and the construction of the urban environment are a long-term process that marks the living conditions for several generations (Dvornik Perhavec, 2010) (Christensen, 1999) (Grum, 2012).

### 8.3.3. Understand HB or BCC as a part of system

Why should need the system and why should need view through the point of system? As Bertalanffy defined (Bertalanffy, 1979) the system is more than a sum of parts, it is complex and it involves interaction. System theory was always an integrative tool for all sciences, aiming for a dialogue between scientific disciplines. However, a city center is a system of different buildings for example galleries, operas, sport parks, old and new buildings, traffic, river/rivers/ocean, marine, airport, sport areas, playgrounds, schools, houses, skyscrapers, hospitals, hotels,...different infrastructures,... The wider/border concept of real estate is therefore an economic, technical, sociological, psychological category and as such represents a grateful starting point for an interdisciplinary approach (Grum, in drugi, 2011). In Fig. 1, the presented model of the City system, where various specialized uses



and activities intertwine. The city affects the global system (the Chernobyl case) and the global system influences events in the city (Hamburg case with diesel cars). A hot topic in Europe is diesel cars. In Hamburg, Germany this week came into force a ban on driving with diesel vehicles, with certain exceptions for two urban roads are allowed. Similarly, are predicted for other cities in Germany and across Europe (RTV SLO, 2018).

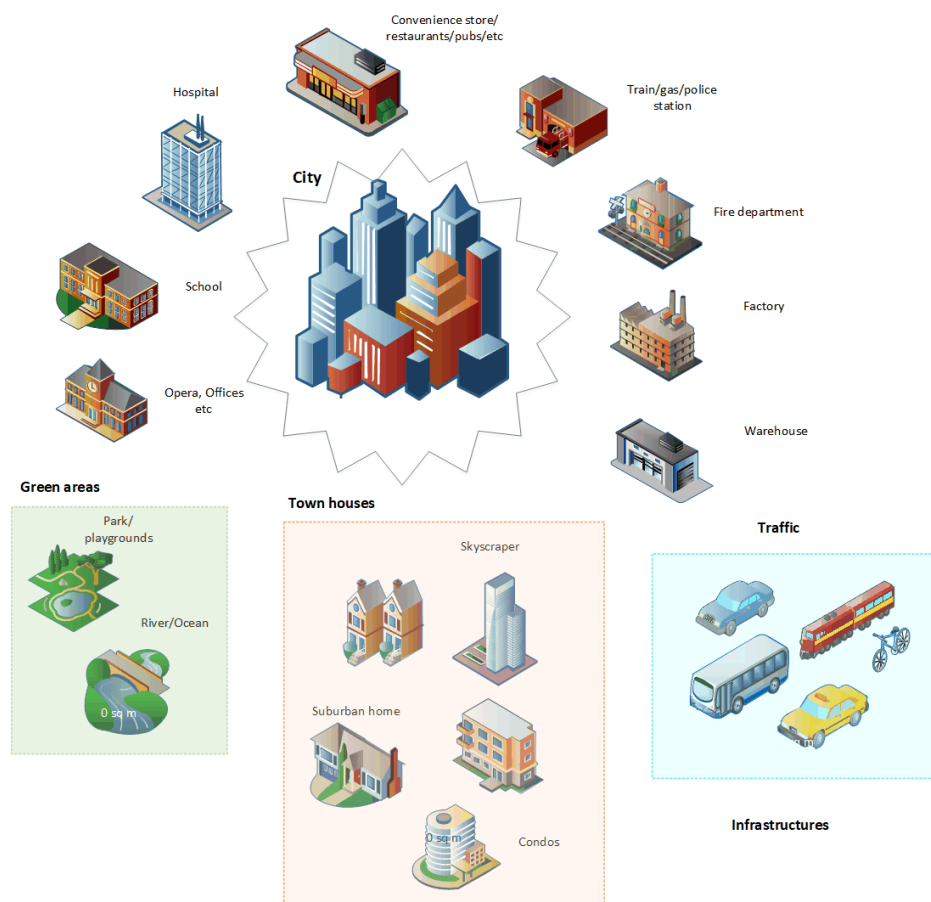


Fig. 1: City as a system

#### 8.3.4. Close (nearby) and distant surroundings

Real estate HB or BCC value includes properties that do not come out of buildings, such as traffic, sun exposure, distance between social buildings (hospital, BUS station, railway station, and schools), noise, air pollution, etc. HB or BCC is a part of a higher / larger system (Dvornik Perhavec, in drugi, 2014). Real estate represents in many reasons an interdisciplinary polygon and is a part of the whole/bright global system. In Fig. 2 shows how people who live in CCB or HB (turkiz arrow) effect to city (produce traffic, make houses, offices, etc.) and in the same time buildings CCB or HB (with material, living area, distance to school, green areas, etc.) are effect to people who live there. But in the same time, the buildings and city center is interesting for tourists, researcher, facility managers, mechanical engineers, art historians, historians and real estate value. For HB or CCB should be taken into account all data to get a real value of buildings or flats in City Centre.

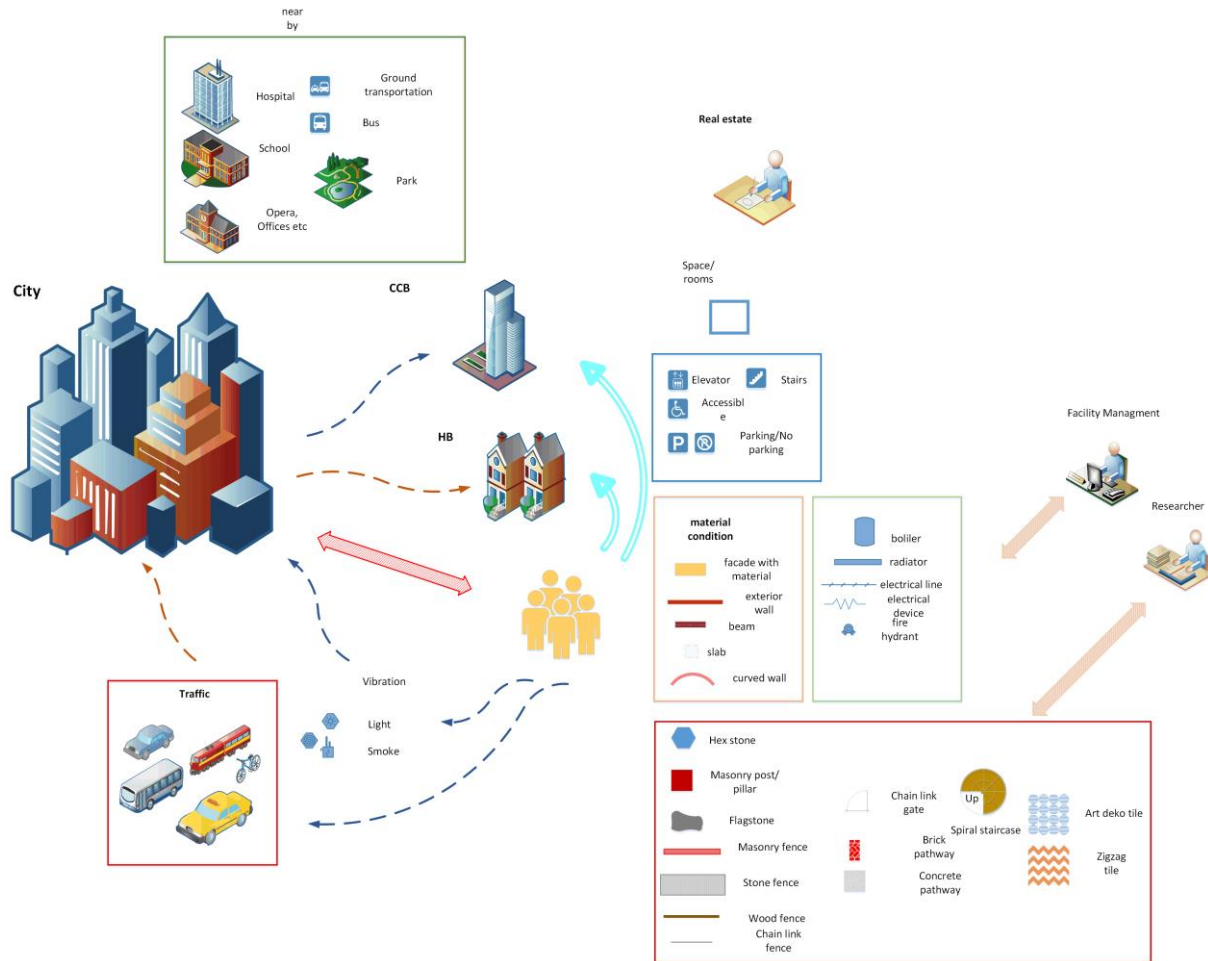


Fig. 2: HB or CCB as a part of higher/bigger system

In this point of view HB or BCC is part of higher/bigger system and this is reason why real estate represent in many reasons to interdisciplinary polygon and why is a part of the whole global system.

### 8.3.5. INTERNATIONAL VALUATION STANDARDS (IVS 2017)

IVSC has launched IVS 2017 marking an important milestone towards harmonizing valuation practice across the world. Purpose of IVS 2017 is as the key guidance for valuation professionals globally and underpins consistency, transparency and confidence in valuations which are key to investment decisions as well as financial reporting and raise standards of international valuation practice for the benefit of capital markets and the public interest.

IVS 2017 (International Valuation Standards (IVS); (International Valuation Standards (IVS) Council, 2017) comprises five General Standards and six Asset Standards. The General Standards set requirements for the conduct of all valuation assignments including establishing the terms of a valuation engagement, bases of value, valuation approaches and methods, and reporting. The Asset Standards include requirements related to specific types of assets, including background information on the characteristics of each asset type that influence value and additional asset-specific requirements regarding common valuation approaches and methods used.

This standards mention valuation as a networks or agglomerations of multiple individual components, each having their own characteristics (for example infrastructure) and each may have its own life cycle and therefore need to be addressed separately in the valuation analysis.

Heritage assets may include historical buildings and monuments, archaeological sites, conservation areas and nature reserves, and works of art. Heritage assets often display the following characteristics, although these characteristics are not necessarily limited to heritage assets:

- Their economic benefit in cultural, environmental, educational and historic terms is unlikely to be fully reflected in a financial value based purely on market price,
- Legal and/or statutory obligations may impose prohibitions or severe restrictions on disposal by sale,
- They are often irreplaceable and their economic benefit may increase over time even if their physical condition deteriorates,
- it may be difficult to estimate their useful lives, which in some cases could be hundreds of years.

Generally, IVS 2017 permits two models for the recognition of operational assets in the statement of financial position: a cost model and a fair value model. "The fair value of items of property is usually determined from market based evidence by appraisal. The fair value of items of plant and equipment is usually their market value determined by appraisal. "If no market evidence is available to determine the market value in an active and liquid market of an item of property, the fair value of the item may be established by reference to other items with similar characteristics, in similar circumstances and location." For some buildings it may be difficult to establish their value because of the absence of market transactions.

Because of the lack of evidence of comparable market transactions for many assets, the market approach often cannot be used, and sanctions the use of alternative valuation methods to measure the fair value of an asset. According this information the question is which alternative valuation methods to fair value for building with historical property? Historic property is a broad term, encompassing many property types. Some historic property is restored to its original condition, some is partially restored, and e.g. the building façade and others are not restored. Historic property also includes properties partially adapted to current standards, e.g. the interior space, and properties that have been extensively modernized. A historic property is real property that is publicly recognized or officially designated by a government body as having cultural or historic importance because of its association with a historic event or period, with an architectural style or with a nation's heritage. The characteristics common to historic property include the following:

- Its historic, architectural and/or cultural importance,
- The statutory or legal protection to which it may be subject,
- Restraints and limitations placed upon its use, alteration and disposal,
- A frequent obligation in some jurisdictions that it be accessible to the public.

Historic property may have legal or statutory protection because of its cultural and economic importance. The UNESCO4 Glossary of World Heritage Terms defines cultural heritage and cultural property as follows:

- "Cultural Heritage. Three groups of assets are recognized:
  - (a) Monuments:, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science;
  - (b) Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science; and
  - (c) Sites: works of man or the combined works of nature and man, and areas including archaeological sites, which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view."
- "Cultural Property is property inscribed in the World Heritage List after having met at least one of the cultural heritage criteria and the test of authenticity."

### 8.3.6. Valuation approaches

The three principal valuation approaches described in the IVS Framework can all be applied to the valuation of a historic property; market, income and cost approach.

Market Approach based on comparable properties, which is especially important to find comparable properties with historic features similar to those of the subject historic property. Criteria for the selection of comparable properties include architectural style, property size, specific cultural or historic associations of the subject property and similarity in location as regards zoning, permissible use, legal protection and concentration of historic properties.

Historic property fully utilized for commercial purposes may be valued by means of the income approach. Where the distinctive physical features of a historic property contribute to its drawing power under an income producing use, it is particularly important to reflect the cost of any work necessary to restore, adapt or maintain the features of the property.

When applying the cost approach to the valuation of a historic property, consideration is given to whether the historic features of a building would be of intrinsic value in the market for that property. In this case is important also service potential, for example national gallery.

Every Approaches have a own recommendations and view to same building.

The valuation of historic property requires consideration of a variety of factors that are associated with the importance of these properties, including the legal and statutory protections to which they are subject, the various restraints upon their use, alteration and disposal, and possible financial grants, tax rate or tax exemptions to the owners of such properties in some jurisdictions.

When undertaking a valuation of a historic property, the following matters should be considered depending upon the nature of the historic property and the purpose of the valuation:

- (a) The costs of restoration and maintenance may be considerable for historic property and these costs, in turn, affect the value of the property.
- (b) Legal measures to safeguard historic property may limit or restrict the use, intensity of use or alteration of a historic property.

The valuation of historic property involves special considerations dealing with the nature of older construction methods and materials, the current efficiency and performance of such properties in terms of modern equivalent assets, the appropriateness of methods used to repair, restore, refurbish or rehabilitate the properties, and the character and extent of legal and statutory protections affecting the properties.

But not all historic property is necessarily recorded in registers of officially designated historic properties. Many properties having cultural and historic importance also qualify as historic property for example: Kropa. In Fig: 3 with magenta line is showed city area as a legal protected as a City center, but with red color is colored Cultural Heritage.

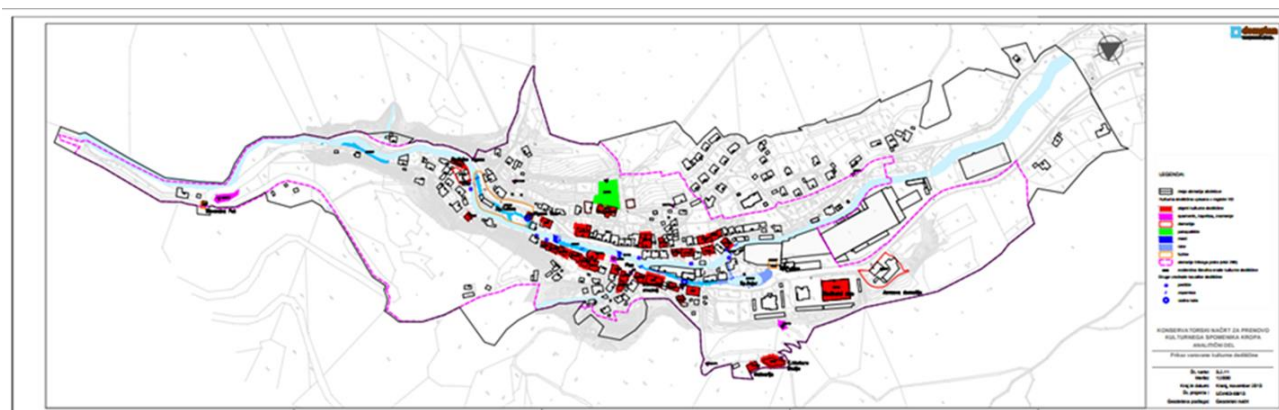


Fig. 3: Kropa - the small city in Slovenia

In this case the house which is not Cultural Heritage is valued differently such as neighbor house, even in the same legal protected city area.

According to these recommendations from IVS 2017, very important to valuation is to treat HB or BCC as a system. If we want to answer the question What is the real value of HB or CCB, the building is to be viewed from several points of view, such as uniqueness, non-transferability, sustainability, limitedness, utility (Grum, 2012).

According to Dasso and Ring (Dasso, in drugi, 1985), real estate has certain specific properties, which distinguish it from other goods. These are:

- Physical properties (immovability, indestructibility, heterogeneity, complexity),
- Economic characteristics (rarity, social character of the environment, sustainability),
- Institutional characteristics (legislation, local customs, influence of interest communities)

The question is: Which is the real value of fence or pavement in Fig. 4a and 4b? How is to value intangible heritage as a knowledge, material and art value?

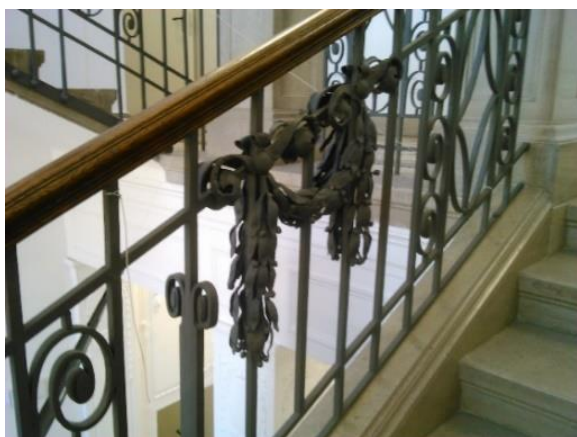


Fig. 4a The fence



Fig. 4b The pavement

### 8.3.7. Innovative solution

How to get all properties of HB or CCB as a part of a system which will help to value real estate? The answer is in the big data base. Expansion of digitalization is one of the steps to obtain a system of elements of existing buildings.

In Fig 5 is showed the process how in the easy way get enable knowledge. Of course, in the beginning of the process is needed a lot of researches, and people who will collected the information, but in the end, the knowledge is shared to many scientist and professionals. To gain knowledge about building requires a lot of time and patience.

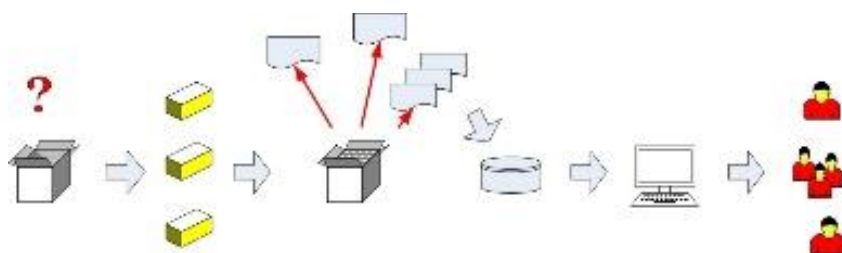


Fig. 5: Process from digitalization to sharing knowledge

Information technology is allowed to get a wide range of information faster and better than in the past and at the same time that the same information's change into the necessary knowledge. Sharing the knowledge could improve view of real estate as a system, and predicting the consequences of B and CCB valuation model.

In our past work, (Dvornik Perhavec, 2012), (Tibaut, 2011), (Tibaut, in drugi, 2017), (Tibaut, in drugi, 2018), (Tibaut, in drugi, 2018) the few ontologies and protocol have been done. In Fig 6 a and 6b is showed few buildings with properties (6a) and in Fig 6b connecting between, Classes, Object and Data properties.

Ontologies are made with Protégé software.

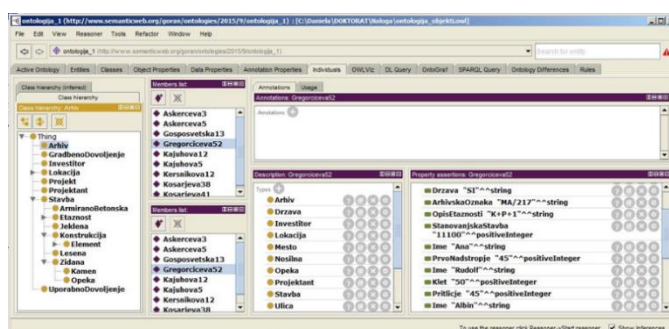


Fig. 6a: Ontology

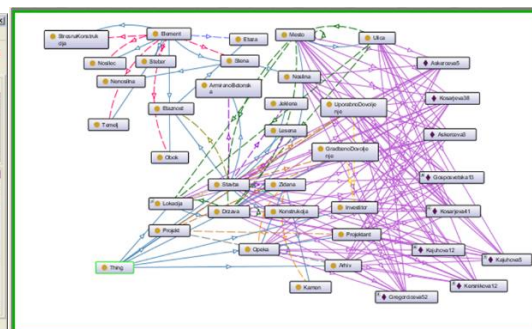


Fig. 6b: Ontology

Ontologies enable managing with data within an interdisciplinary view of the same building, so the concept is suitable for interdisciplinary approach, which is real estate is as an economic, technical, sociological, psychological category.

### 8.3.8. Conclusion

The paper shows the concept of how to evaluate HB or CCB in a simpler and faster way with all the recommendations IVS 2017. It is could will be include to IVS Approach for Tangible assets for buildings of historical or heritage value.

Digitalization of elements of buildings will represent the huge work in the next few years. With collectivity approach, the interdisciplinary real estate was got a new place to the system as a HB or CCB. With created and develop ontology with all properties was provided a easier and faster way to valuation in different way, fairly which based on real data of HB or CCB. HB or BCC are important to understand our history and they are like books that contain history of knowledge of engineering and arts.

The idea arise from Cost Action TD 1403Advances in Digital Cultural Heritage where were created model for collected and produce knowledge as a result of ontology. The goal of database is to be a simpler and faster way to gain knowledge about the object and system. The system is a picture of human thought about reality, but it is not

whole reality, it is a small or big part of this, depends on human perspective. The system is not a reality but the author's design about some part of the reality. The system is always complex.

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## **8.4. Residential Community Management Software: A Case for the Use of 4.0 Technology**

### **Residential Community Management Software**

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#### **8.4.1. Abstract**

The rise of cities and population in urban areas has led to the development of apartment blocks and the construction of homes on a common land, where facilities and costs are shared between co-owners. These are commonly Homeowner Associations (HOAs), where co-owners appoint a governing body amongst the owners to oversee the actual completion of maintenance, budgeting, accounting and other related tasks. The governing body work is voluntary without monetary retribution for members, except for the employees contracted by the HOA. The resulting problem in many cases is lack of incentives for the owners and the board to devote the time that these tasks require. This paper describes the issues encountered in HOAs and outlines a case for the use of 4.0 technology in residential community management software to tackle the existing problems.

#### **8.4.2. Introduction: proliferation of residential community associations**

While it is difficult to calculate an accurate number of houses in the entire world, statistics by The World Bank show that there were 7.35 billion inhabitants in 2015. With an average of 3.5 persons per household, we can estimate that there are approximately 2 billion households worldwide (UN Department of Economic and Social Affairs, 2017).

The Department of Economic and Social Affairs of the United Nations Secretariat also indicates that more than 54% of the world population now live in urban areas. By 2050, this number is expected to reach 66% (UN Department of Economic and Social Affairs, 2014).

The growth in urban population around the world has been very fast since 1950—from 746 million to 4.03 billion in 2016 (The World Bank, 2016).

The residential market can be divided into properties that share common elements with their neighbors, and those that do not. We focus on the first group, those sharing common facilities and governed by community associations.

In the United States, the Community Association Institute reported that the number of this type of association grew from 10,000 in 1970 and 222,500 in 2000; to 342,000 in 2016. Meanwhile, in the European Union, it is estimated that almost half of all properties belong to some variant of community association such as a block of apartments, condominium, or residential villa (Eurostat, Housing statistics, retrieved by type of dwelling, 2015).

This accelerated growth rate has moved several countries to create specific legislation to regulate this type of dwellership with common facilities. Horizontal property legislation has been established in most countries since the 1960s.

With a growing tendency among newer generations towards dwelling in residential communities with shared facilities, good management practices and software tools to implement in these communities are increasingly required (McKenzie, 1994; Stabile, 2000).

#### **8.4.3. Problems in management of residential community associations**

It could be reasonable to expect that an arrangement like a community association would work in the common interest of property owners and foster better interactions between them. The reality appears to indicate the opposite, though. Bell, in his 1995 article 'Residential Community Associations: Community or Disunity?' demonstrates that the absence of effective management practices in residential communities has led homeowners to act in their self-interest and independently, rather than in the best interest of the collective.

In this article, we look into a few issues that contribute to this problem. On one end, there are the perennial complaints from homeowners about lack of transparency in community associations: how their fees are handled (or mishandled), missing receipts, confusing or incomplete record keeping and accountancy, nepotism in the selection of service providers, difficult access to meeting minutes and past agreements, and other complexities (McCabe, 2005; ElCorreo.com, 2014; Huffington Post, 2016).

Even if transparency is not an issue in a residential community—perhaps due to good use of software or effective management practices—there still exists a generalized lack of interest among owners and management companies to get involved in completing tasks in the community, even with the technological tools available to them. This is a recurring problem at a global scale (Sheng Han & Yuan Lim, 2001; Wang, 2014).

#### **Transparency**

Transparency with community accounts is a huge issue in Spain, where 80% of properties fall under Horizontal Property Law regime (El País; Flores, 2015). Corruption is the second topic of most concern for Spanish citizens after the economic crisis of 2013, according to CIS research center. Illegal practices in the management of residential communities are widespread in this country (El País, 2007, 23, 06. Espejo Publico, Antena 3. 2017, 13, 06).

In the US and the UK, transparency issues with homeowner associations have also been reported by media such as The Washington Post, New York Times and The Guardian. One of this news stories focused on their negative influence in the value of real estate assets.

Specific areas of concern with transparency are the selection of service providers by community boards and management companies. Accountancy and expenditure of community fees. Lack of access to documentation such as Annual General Meeting minutes, community expenditure records and invoices. And finally, the way board members are appointed.

#### **Lack of time and interest**

In community affairs:

Self-interest, especially economic, predominates in basically all residential communities. About 80% of homeowners in California would rather avoid HOAs (Barton & Silverman, 1994). A 1995 article called 'Residential Community Associations: Community or Disunity?' already demonstrated that the absence of effective management practices in residential communities has led homeowners to act in their self-interest and independently, rather than in the best interest of the collective.

In using software for property management in residential community associations:

A common issue with software –in particular with customer relationship management (CRM) platforms– is a lack of interest to continue using it after it has been learned and adopted. To look into this problem, it is crucial to understand what motivates users (Reynolds, 2002). The onset of mobile technology has also played a role in shifting users away from platforms that were specifically designed for desktop environments (Meeker, 2018).

#### **8.4.4. Proposal for the use of 4.0 technology in Residential Community Management Software**

PropTech is to real estate what FinTech is to the financial world. The problem is that the real estate world has been traditionally slow in adopting meaningful new technology. It tends to react rather than innovate (Barzilay 2017). Currently, the slow pace of progress in this sector has meant that many of the latest technology adoptions are just with so-called 2.0 technology, which basically allows for limited interactions while providing general information to users.

However, this is no longer sufficient and here is where we propose the use of 4.0 technology to revolutionize this sector with a shift in paradigm towards decentralization, automation and even gamification.

Industry 4.0 refers to a fourth stage in the industrial-revolution process. According to Bangman, Bauer, et al. (2016), the future of industrial revolution will be characterized by three main aspects:

- A new level of organising and controlling the entire value chain with the life cycle of products.
- The availability of all relevant information in real time which is achieved by interconnecting all instances that participate in the value creation processes.
- The creation of dynamic, real-time optimized and self-organizing cross-company value networks by interconnecting humans, objects and systems, and their abilities.

According to this description, an Industry 4.0 version of residential community management should include a new organizational approach, with access to real-time information, and with interconnected parties that can equally contribute to the upkeep of the community and take advantage of new technology and systems for this purpose.

Technologies that could be implemented to assist in this disruption of traditional management methods include blockchain ledgers, smart contracts, crypto tokens, Internet of Things such as sensors and devices with cloud connectivity, plus artificial intelligence or machine learning.

#### **Blockchain and smart contracts for transparency and decentralization**

Originally developed as an accounting method for the virtual currency [Bitcoin](#), blockchains –which use what is known as distributed ledger technology (DLT)– are appearing in a variety of commercial applications today. Currently, the technology is primarily used to verify transactions within digital currencies, though it is possible to digitize, code and insert practically any document into the blockchain. Doing so creates an indelible record that cannot be changed. Furthermore, the record's authenticity can be verified by the entire community using the

blockchain instead of a single centralized authority. This technology eliminates unnecessary intermediaries (Iansiti & Lakhani, 2017). Transactional speed, accuracy and transparency are all achieved through blockchain technology (Cushman & Wakefield 2018).

As recently stated by Spanish blockchain and artificial intelligence expert Francisco Maroto, blockchain and smart contracts can assist in the potential chaotic interaction between Internet of Things devices in Smart Homes and Smart Communities (Maroto, 2018). It could also assist in the implementation of homogenized languages and data flows between Smart Homes and Smart Cities.

An organic way of implementing blockchain technology in residential community management can be the decentralization of voting and community regulations. A blockchain protocol for voting would ensure that all property owners can vote, while the voting is not rigged or manipulated. Another possibility is the implementation of industry-standard community bylaws with smart contracts. This protocol could be implemented and accessible by any community or software company willing to blockchain their current bylaws, or to create new bylaws from scratch.

### **Gamification to incentivize users**

Gamification schemes and tokens can be useful in an attempt to incentivize different types of users. Over the years, there have been numerous scientific studies that demonstrate the use of token economies as reinforcement systems with the objective of shaping behaviours (Kazdin, 1977 & 2017. Sran and Borrero, 2010).

Gamification could be an adequate solution to incentivise homeowners. For example:

- If users complete tasks on time and they are properly rewarded and incentivised with tokens, they should be able to complete more duties;
- That if positive behaviour is reinforced and improved when these tokens are exchanged for varied items such as fiat money, external services, or goods; then the more work they do, the more tokens they will earn. This should result in a better chance of users holding onto tokens for a better exchange rate in the future.
- By using gamification techniques where we give or deduct points, you create a competitive environment where service providers -as well as homeowners- can all take part in these tasks and earn tokens. The result will be a highly-efficient and competitive ecosystem where jobs are completed in the shortest time possible, and at the least possible cost.
- By creating a token economy in the sector of residential communities, we can resolve the problems we are trying to address: to incentivize users, increase task-completion, and therefore benefit the whole ecosystem immediately.

### **Internet of Things (IoT), smart homes and data analytics**

Data fuels Industry 4.0 and successful data analytics is the prerequisite for successful implementation of digital enterprise applications (PWC, 2016).

4.0 disruption in management of residential communities will be a slow process, as previously indicated. When significant changes need to be made, the best way to implement them is by data-driven decision making (PWC & Forbes Insights, 2016). It is particularly hard to obtain meaningful statistics about residential community numbers, let alone about users.

Technology should at the initial stage be able to gather as much information as possible to enable subsequent improvements. IoT devices are a good start. Mobile phones and sensors can gather data for further analysis, such as comparison of utility bills. Data from users of current platforms could also be a source of valuable information. When analysed, it will be easier to see which areas of community life they rate higher: transparency, online payments, rewards, or perhaps a different one. Surveys with current users should be conducted with priority in order to validate the different needs in this area.

Regarding different entities in the world of “smart” living, the “smart community” concept becomes the agent between data generated at domestic level by “smart homes”, and at macro level by “smart cities” (Chourabi et al., 2012). It is unrealistic to expect smart cities to access data generated by private households without the

proper legislation and procedures. The wide variety of data generated by both levels of smart entities creates an additional difficulty for data analysis and implementation of change (Hollands, 2008). A new blockchain protocol at smart community level could and should normalize data and requests generated by IoT devices from top and bottom-level smart entities (Perera et. al., 2014).

#### **Artificial intelligence (AI) for automation of duties**

According to a study commissioned by the Virgin Group, artificial intelligence is likely to automate repetitive tasks and free up time for human workers, so they become more creative and valuable in tasks that really matter and create value (Ross, 2018).

With the right technological foundation, smart communities could learn from repetitive tasks arising from community accountancy, facility maintenance and customer service. They could then automate certain actions like payments and bookkeeping, as well as pre-approve others that would normally require unnecessary and centralized approval. According to recent research, the combination of blockchain smart contracts and artificial intelligence can significantly reduce time and monetary costs, while at the same time increasing efficiency and legal compliance.

The general idea is that with more communities and data flowing through a smart system, automation by machine-learning type of artificial intelligence should improve over time.

#### **8.4.5. Conclusion: Not just another software, but a revolutionary approach to managing residential community associations**

Most software available for management of residential communities focus on the property manager as the main user. Only a handful (e.g. Urbytus) have decided to look at things from the homeowners' perspective (Reynolds, 2002). When community associations start looking for ways to save money and residents are motivated enough to take a hands-on approach with its maintenance, this second type of software may become more appealing to them.

Considering the sharp rising trend in telecommuting (National Multifamily Housing Council, 2018) homeowners and tenants are spending more and more time in their dwellings, it is perhaps reasonable to expect that their interest in looking after shared spaces in their apartment buildings or condominiums will increase, regardless of whether they own or rent.

When we look at the proposed technological and cultural changes that Industry 4.0 might bring into residential communities, we see a world where dwellers –owners or tenants– are more involved. The common interest is finally aligned with the self interest.

If equipped with the right technology, we believe incentivised dwellers can become the primary workforce in residential communities, driving service providers and management companies to shift towards more specialised, efficient and hard-to-replace functions.

This leads to the issue of unnecessary friction in the administration of residential communities– questioning the role of bureaucracy and intermediaries like professional property administrators. Newer generations embrace a do-it-yourself attitude that, coupled with new technological advancements, open exciting opportunities (Comm, 2017). A new business model is certainly needed. While blockchain and other 4.0 solutions are the foundational technologies of new property-management practices, real disruption will take time and business models will need to adapt first (Iansiti & Lakhani, 2017).

Looking into the future, does this change mean that property management companies will be unemployed? Certainly not. As with other industries where technology has disrupted traditional practices and changed business models, stakeholders usually adapt and satisfy needs in the market in different ways.

The scenario that will most likely emerge after technological disruption in this sector will have residents self-managing tasks on one end, automated systems simplifying processes in the middle, and specialised service

providers on the other end, adding value where it matters. As explained before, AI cannot resolve everything and will most likely focus on repetitive tasks.

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## 9. New Housing Forms



## 9.1. Empowering Encounters: An exploration of smart environments for stimulating encounters for older adults with dementia in inpatient facilities

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### 9.1.1. Abstract

**Problem field:** The demand for the smart dementia-friendly infrastructure is rising as the Netherlands faces an ageing population and an increasing number of older adults with a form of dementia. Social interactions are vital to quality of life, however, people with dementia experience increasing problems with social contact as the disease progresses (Jonker, Slaets, & Verhey, 2009). One way to stimulate social health is by enabling different forms of social contact, ranging from observing social interactions to active (digital) social interaction using (non-)verbal communication (Hubbard, Downs, & Tester, 2003). Literature reveals all these forms can help maintain the health of a person with dementia, specifically by decreasing medicine use, agitation and increasing quality of life (Ballard et al., 2018). Those living in inpatient facilities seem to benefit from (smart) environments (Mohammadi, 2014), although these are often not aimed at increasing social contact but mostly use sensor technology to identify activities, track well-being and context-aware functional feedback (Cook, et al. 2010)

**Purpose of Study:** The aim of this study is to explore where and when encounters for older adults with dementia in inpatient facilities can be stimulated using smart technology and physical infrastructure. This paper regards smart environments as a seamless integration of technological and architectural interventions.

**Methods:** This paper examines (smart) environments for stimulating social interactions by using academic literature and examples from practice in the Netherlands. However, there are a limited number of examples of smart environments for stimulating encounters in practice and science. And as smart environments are integrations between technology and architectural interventions, these interventions are examined separately as well (just technological or architectural interventions). Smart environments are studied in relation to social interaction and are explored over time.

**Findings and Results:** Both architectural and technological dimensions can influence social interaction in this target group. While social interaction can be increased using (a combination between) technology and architecture, at the moment these are two separate fields. Research shows that there are few examples of smart environments for stimulating encounters, however, effects of these smart environments are rarely examined.

**Conclusions and Discussion:** Among spatial and technological interventions in inpatient facilities there is a shift visible from supporting to stimulating people with dementia in their daily activities, by using experience-based spaces or products. These trends are also seen in the few examples of smart spaces available for this target group. Important in the design and realization of smart environments is that it should create a feeling of home, in order to connect to the experiences and perceptions of its occupants (Astell, 2006). To achieve a smart environment that can stimulate encounters while still feeling like home, it is important that technology is seamlessly integrated into the environment.

**Keywords:** Dementia; Architecture; Smart technology; Encounters; Inpatient facilities; Stimulation

### 9.1.2. Introduction

#### Dementia

Changing demographic, societal and political circumstances lead to a larger percentage of people needing care (Beard, Officer, & Cassels, 2016). This is specifically germane in the case of older adults. Many older adults cope with some form of dementia. In 2017 in the Netherlands, there were 270.000 older adults living with dementia, of which 70.000 live in a nursing home (Alzheimer NL, n.d.). There are several forms of dementia, of which Alzheimer and vascular dementia are the most common types, which is determined by the progression of the illness (Jonker et al., 2009). Dementia in older adults is strongly correlated to age and multi-morbidity; as such the 'type' of dementia is more important for medical research purposes than for the treatment and support of this age group in practice (Jonker et al., 2009).

People with dementia suffer from limitations in numerous social, physical and mental health areas. Many complaints already manifest itself in the home situations, such as problems with memory, tasks of daily living or emotional health (Grave & Mohammadi, 2018). Some problems, such as increasing social isolation, exacerbate when people cannot live at home any longer and need a place in an inpatient facility (Reisberg, et al., 1982). With the increasing number of people with dementia, but a decreasing number of spots in inpatient facilities, it is to be expected that the people who do live in these inpatient facilities suffer from later stage dementia and have greater care needs. This increasing care demand also puts pressure on the labour market: there is an imminent shortage of care staff both for outpatient, semi-residential and inpatient facilities ("Patiënt heeft last van tekort aan zorgpersoneel", 2017; Zierse, 2017). As such, it is to be expected that the focus is on the functional rather than social and existential parts of (health) care. That being said, the latter are important factors influencing behaviour, progression of the disease and quality of life.

People with dementia often experience difficulty in maintaining social contact or interacting with others and are more often isolated than residents without (a form of) dementia. The importance of being able to express yourself, interact and be part of the community, also for this target group, is addressed in several studies (Hubbard et al., 2003; Hubbard et al., 2002). The gradations of social interaction and the way contact finds place is different per person due to limitations that they are facing because of their dementia. The different forms of social contact range from observing social interactions to active (digital) social interaction using (non-)verbal communication (Hubbard et al., 2003). Literature reveals all these forms can help maintain the health of a person with dementia, specifically by decreasing medicine use, agitation and increasing quality of life (Ballard et al., 2018). Verbal communication, such as short conversations is one form of contact. The other form consists of non-verbal behaviour, such as "body movement, facial expression, touch, physical appearance, personal space, and vocal communication such as pitch, intonation, and speech rate" (Hubbard et al., 2002, p.156).

In the context of an inpatient facility social interaction finds place in different circumstances, for example the contact between the resident and caregiver when the latter is providing care and the interaction between residents and/or caregivers during planned activities. This research paper focusses on the informal social interaction, which Campo & Chaudhury (2012, p.403) define as "any spontaneous contact between two or more individuals, outside planned activities and formal care practices, which includes interpreting and reacting to others in a verbal or non-verbal capacity".

### **Smart Environments**

In traditional environment-behaviour studies, research has focused on physical or built environment as static environments (Bandura, 1989), in which the effect of specific circumstances on an independent variable is tested. With the rise of technology, the built environment has the opportunity to become more adaptive and responsive (i.e. smarter) than before. To achieve smart environments, ambient intelligence can be used to create environments that can react to their inhabitants (Aarts & Wichert, 2009). Developments such as sensor technology, Internet of Things and Big Data are important influences on the way people and buildings interact (Lui, Nakata, & Harty, 2011). Current technology is implemented to create 'intelligent' or 'smart' buildings that automate many building processes and can contribute to healthier, safer and more sustainable buildings (Wong, Li, & Wang, 2005). However, next to intelligent energy and indoor climate management, technology can contribute to many other elements. With changes in technology, not only data on the environmental parameters can be gathered, but also data on behaviour (Kaptein et al., 2010; Mohammadi, Arts, & Pagter, 2012). These developments in technology allow for this technology to be integrated and to disappear into the environment (Cook & Das, 2007). Through these changes in technology it is not only possible to support and stimulate people through technological applications or products, but also through smart environments. These environments are a combination between the built environment and this 'disappearing' technology that aim at improving the user experience in the space (Intille et al., 2003). There is some research on the implementation of smart environments for older adults with dementia in the form of 'smart homes'. What can be found in these examples is that most focus on automating many processes in the home, and as such support people in their daily activities. In fact, many articles focusing on the home environment claim that smart home technologies should minimize interaction with its user (with dementia) (Orpwood, et al., 2005). This is in contradiction with a changing paradigm on care, in which stimulation (of certain types of behaviour and activities) is transforming care for older adults (with dementia). This article aims at investigating the possibilities of smart environments for stimulating social interaction.

### **Stimulating as new concept in care**

Demographic changes will cause an increase in the total amount of older adults, an increase in the older old (85+ years) and a rise in the number of older adults with dementia. However, there are also important social, cultural and political changes that have changed the way society looks at care. One change is the shift towards 'positive health' (Huber et al., 2011) in which health not only is seen as the 'absence of disease' but the way one can cope with physical, mental and social changes and the level of autonomy of a person. This has affected inpatient facilities as well. More and more inpatient facilities aim not to only 'care for' their residents, but to try and enable or stimulate them to stay active themselves. Also, autonomy and the possibility to make choices are themes that are part of the care concept. Furthermore, next to a shift towards 'stimulation' one can see a focus on 'personalization', in which a person's former lifestyle and preferences are reflected in the living environment, interior or products used (Chaudhury, Hung, & Badger, 2013; Davis et al., 2009; Marquardt, Bueter, & Motzek, 2014; Rijnaard et al., 2016).

One of the specific health areas that is important for older adults with dementia is the maintenance of social networks and stimulation of social interaction. Especially when people move from their home to an inpatient facility and their former social network in the neighbourhood is often left behind. Traditionally, inpatient facilities stimulate social interaction between residents by organizing activities or by offering activity programs. These can have a

beneficial effect on social health (Robinson et al., 2006). New technologies, insights in the effect of the built environment and the rise of smart environments can contribute to stimulating informal social interaction, outside the regular (care and activity) program, for people with dementia in inpatient facilities without greatly increasing the care burden on (in)formal care.

Although aspects such as the care concept and group size also play a role in stimulating social interaction in inpatient facilities, this research paper focusses on (smart) environments in relation to stimulating social interactions.

### **Smart environments for stimulating encounters**

For the growing group of people with dementia living in or near an institution social interaction is an important factor contributing to quality of life. These institutions recognize the importance of social interaction, but at the same time experience limitation in terms of staff, money and time and a changing paradigm towards stimulation and personalization. With the rise of smart environments, made possible through technological innovation, social interaction may be stimulated. It could increase the potential effect that the built environment has on encounters and social interaction. However, in practice, one can see that there are few smart environments for stimulating encounters or that social interaction is often a (unintended, although not unwelcome) side-effect rather than main focus of smart environments. This research aims to give a state of the art of smart environments for stimulating encounters. Specifically, the aim of this study is to explore where and how encounters for older adults with dementia in inpatient facilities can be stimulated using smart technology and physical infrastructure. This paper regards smart environments as a seamless integration of technological and architectural interventions

### **9.1.3. Methodology**

This paper examines (smart) environments for stimulating social interactions by using academic literature and examples from practice in the Netherlands. However, there are a limited number of examples of smart environments for stimulating encounters in practice and science. And as smart environments are integrations between technology and architectural interventions, these interventions are examined separately as well (just technological or architectural interventions). Smart environments are studied in relation to social interaction and are explored over time.

To examine the state of the art of (smart home) technologies for stimulating social interaction for people with dementia in inpatient facilities, 45 peer-reviewed articles were selected for review. Of these articles, 23 were (systematic) reviews: 4 were selected as reviews on AAL technologies or smart home technologies for older adults and 19 were reviews on (specific areas of) AAL technologies or smart home technologies for older adults with dementia (with applications in both inpatient and outpatient). The other articles discussed research on specific interventions for people with dementia in inpatient facilities. Search terms included: “smart home technologies”, “ubiquitous computing”, “Ambient Assisted Living (AAL)”, “smart technology”, “technological interventions” and “non-pharmacological interventions” in combination with “dementia”, “inpatient facilities” and “cognitive impairments” and “social interaction”. Google scholar, Pubmed, Cochrane library and Scopus were used as databases. Only articles that were peer-reviewed and written in English or Dutch were included.

To examine the state of the art of the design of the physical environment of inpatient facilities related to social interaction for people with dementia, 31 peer-reviewed articles were selected for review. Of these articles, 14 were (systematic) reviews: 3 were selected as reviews on the effect of the physical environment of inpatient facilities for older people on behavioural aspects and well-being, of which 11 focus on the impact of the physical environment of inpatient facilities for people with dementia on behavioural aspects and well-being. The other articles discussed research on specific interventions for people with dementia in inpatient facilities. Search terms included: “design interventions”, “architecture”, “physical environment”, “indoor environment”, “small-scale” and “design” in combination with “dementia”, “inpatient facilities” and “social interaction”. Google scholar, Pubmed and Scopus were used as databases. Only articles published in the period 1990-2018 and that were peer-reviewed and written in English or Dutch were included.

#### 9.1.4. Findings

This chapter examines the effect of architecture on social interaction and specifically which spatial interventions in inpatient facilities for people with dementia are able to stimulate social contact between residents, caregivers and visitors. Separately, the impact of smart technology on social interaction will be addressed and interventions of smart technology in inpatient facilities for people with dementia for stimulating social contact are shown.

#### Architectural Developments

##### History

Throughout history, the role of architecture in relation to social interaction has been a much researched subject. It can be assumed that architecture, at different scales, has influence on the frequency and quality of chance encounters (Alexander, Ishikawa, & Silverstein, 1977; Gehl, 2011; Jacobs, 1992). These chance encounters, for example between neighbors, can increase, among others things, the concept of public familiarity. Public familiarity refers to recognizing people and being recognized in the local living environment (Blokland & Nast, 2014). The frequency and kind of use of these places can have an impact on these spontaneous, perhaps superficial and short encounters with both acquaintances and strangers, which as a result can make people feel safer and more at home. Not only chance encounters can lead to public familiarity, they can also stimulate social interaction. This in turn can stimulate place attachment, the resident's emotional and physical bonding with the neighborhood (Wiles et al., 2009). Although these concepts focus of designers and researchers throughout time, changing circumstances and possibilities have influenced the way these concepts find their way into architecture.

##### Present

Housing typologies for older adults in the Netherlands are changing through political, societal and technological factors. A diversification in typologies and development of new housing typologies is taking place (Mohammadi et al., 2018). Partly thanks to the changing view on healthcare, technological developments and increasing importance of civic society, the traditional division between housing typologies for older adults in inpatient facilities, semi-residential care and outpatient typologies is fading. New forms of living are emerging in which often the concept of communal living is an important starting point. In this way, residents organize mutual informal help, and social control and (care) services can be shared. Within this type of group housing, the semi-public space and shared functions become more important. After all, these are the communal spaces which residents feel a communal responsibility for and that facilitate casual and planned encounters between residents.

##### Social interaction through architecture

In the inpatient facilities a similar shift is seen, namely from traditional care homes to, among others, small-scale care homes and new upcoming typologies (Mohammadi et al., 2018). Several studies indicate not only positive effects of small-scale living (5-15 residents), compared with bigger units, regarding well-being, behavior and functioning of the residents, but also an increased social engagement is seen (Anderiesen et al., 2014; Chaudhury et al., 2017; Morgan-Brown, Newton, & Ormerod, 2012). However, research regarding aspects that are, among other things, related to finance and groups sizes, are not inconclusive. Verbeek et al. distinguish eleven different concepts of small-scale living facilities for people with dementia in eleven countries, among which small-scale living in the Netherlands and Belgium (Verbeek, et al., 2009). Within these housing typologies the social and existential aspects of living and care are given increasingly more attention. This is reflected in a personal approach of care, creating a sense of home and personalization of the living environment (Chaudhury et al., 2013; Rijnaard et al., 2016). Also the importance of physical activity and social interaction with others in relation to the well-being of people with dementia is well-researched (Chaudhury et al., 2017). Social, spatial and technological interventions that are done seem to focus more and more on stimulating activity and social interaction instead of only facilitating them (Calkins, 2009; Campo & Chaudhury, 2012).

Most of the researches regarding the physical environment of inpatient facilities for people with dementia focus on the impact on behavioral outcomes, such as wandering, agitation and aggression. Although the number of articles that focusses on research regarding design and dementia is increasing, the studies are often descriptive in nature, for example analyzing places for social interaction in relation to the layout of the building,

or specific case studies or pilot projects on local spatial interventions and their effect (Day, Carreon, & Stump, 2000; Van Steenwinkel, Van Audenhove, & Heylighen, 2017). In these aforementioned case studies, the sample sizes are often small, absence of a second comparison group and it remains difficult to determine the impact of separated physical characteristics on the behavior and social interaction of the residents (Barnes, 2002). This part of the article aims at given an overview of these research and has been based on (systematic) literature reviews and pilot studies, without pretending to be complete.

The impact of the physical environment on informal social interaction between residents, visitors and caregivers can be discussed on different levels. This paper examines these effects by using different levels based on four of the six layers of Brand (1995), on which of four the impact on social interaction can primarily be seen. Using these layers, a division of the physical environment can be made: stuff (interior design features), space plan (spatial layout of the building), services (e.g. lighting, temperature) and site (the context of the building) (Brand, 1995). In the first place, the impact of the services, space plan and stuff of the building will be addressed. Secondly, the effects of the site of the inpatient facility will be discussed.

Several (systematic) reviews and pilot studies examine factors related to the services, space plan and stuff and their effect on informal social interaction. The layer 'services' is, among other things, the technology in the building and the responsible elements, such as indoor climate. One of the aspects that has an impact on the behavior and well-being of the residents is lighting. For example, a more adequate lighting in the diner area leads to more conversations at the dinner table (Van Hoof et al., 2010).

Regarding the space plan, Campo & Chaudhury (2012) argue that social interaction finds place especially in the dining room, lounge area, corridors and transition zones. Similar to this, the study of Abbott et al. indicates that interaction between residents among each other, caregivers or visitors occur mostly in the shared space (with television), activity rooms, dining rooms and hallways (Abbott, Sefcik, & Van Haitsma, 2017). Logically, these areas seem to hold the most potential for interventions for stimulating social interaction. However, on the other hand, providing sufficient and different gradations of privacy for the residents, seems to have a positive effect on the willingness for social contact of the residents (Barnes, 2002). The presence of various public spaces with a own character seems to have a positive effect on the social behavior of residents (Zeisel et al., 2003). Several authors address the positive effects of an open space plan (open dining room and living area) and a freely accessible kitchen in which residents have the opportunity to help with household tasks or are have visual sight on the preparation of meals (Devlin & Arneill, 2003; Hung, Chaudhury, & Rust, 2015; Moore & Verhoef, 1999; Morgan-Brown et al., 2012). Another important factor regarding the (open) space plan is the presence of sightlines. In particular sightlines located in the transition zone (space between two rooms) has to be taken into account, which provide an overview of the different areas and make social contact possible (Campo & Chaudhury, 2012; Hou & Marquardt, 2010; Van Hoof et al., 2010). With regard to the dining room, Chaudhury argues that smaller dining rooms with a homelike ambient stimulate social interaction (Chaudhury et al., 2017, 2013). Besides the interior floor plan, also the design of the outdoor space should be given attention to (Van Hoof et al., 2010). After all, a comfortable sheltered place outside where residents can enjoy the fresh air and sunlight, facilitates space to encounter.

Looking at the layer of 'stuff', the positive impact of a residential character and homelike environment in relation to social interaction is a recurring topic in several researches (Campo & Chaudhury, 2012; Devlin & Arneill, 2003; Morgan-Brown et al., 2012; Zeisel et al., 2003). The amount, type and location of furniture seem to have an impact on the informal contact between residents (Chaudhury et al., 2013; Hou & Marquardt, 2010). Adequate seating in previous mentioned areas (dining room, lounging area, corridor and transition spaces) with sightlines to other areas, seems to play a role in the amount of social interaction (Campo & Chaudhury, 2012). To facilitate deeper social interactions, such as longer conversations, besides the more informal social interaction, also areas with only a couple of chairs and good sight of the entrance with more privacy need to be present (Ferdous & Moore, 2015). Furthermore, the study of Campo & Chaudhury (2012) shows that the placement of the nursing station in an communal space (instead of in a separated area) increases social contact between residents and residents with caregivers (Campo & Chaudhury, 2012). In the field of interior design, more experimental interventions can be found in practice. For example, an

intervention in the corridor of an inpatient facility for people with dementia, whereby residents, caregivers and family were invited to hang laundry to dry together, an activity that a part of the residents still remember and are able to perform. The long washing line with laundry was prominently present in the corridor, made the space less monotonous and stimulated memories and a feeling of home by its presence and smell of clean laundry and the joint activity seemed to stimulate social interaction between residents, caregivers and family (Snel, 2014). Another experimental spatial intervention is the memory box, a 'cabin' or 'box' on the wall, in which residents independently or with help can place personal objects or photos. This box seems to have, if situated in a strategic location (i.e. embedding in the spatial context) like the entrance of the individual room, a positive effect on several aspects. The box seems to invite people to start a conversation and stimulates interaction between residents, caregivers and visitors. However these behavioral effects have not been researched thoroughly as research focusses on wayfinding, identity and reminiscence (Gulwadi, 2013).

The layer site relates to the building and its immediate surroundings. Within the upcoming small-scale typologies for inpatient facilities for people with dementia and the changing care concept that focusses more on stimulating residents in their daily activities instead of only supporting them, the context of the building seems to get more attention. In these small-scale inpatient facilities the residents' autonomy and their extent of freedom is an important aspect of the care concept, which can be translated into the architecture of the building. For example, the presence and quality of an outdoor space of an inpatient facility can stimulate activities and encounters between residents, caregivers and visitors. When residents are able to use this area autonomously, aspects such as social and physical safety, greenery and comfort are important when designing the space. Also, attention for the (sensory) experience of the residents is a focal point. The green care farm is an example of such a small-scale typology, in which the central theme is enabling the former way of life of the residents, in a homelike environment. People with dementia, who lived/grew up in a rural living environment or have affection with such an environment, are able to continue their old, well-known activities in a similar living environment, which in turn has a positive impact on the social interaction between residents, caregivers and visitors (De Boer, 2017; De Boer et al., 2015). In a more urban context different concepts of small-scale facilities can be found, such as one or a couple of 'normal' dwellings in the neighborhood and projects that are connected with traditional inpatient facilities (Van Liempd et al., 2009). The first concept exists of a standard house in which a normal 'household' in a homelike environment in the neighborhood is ran, which has the potential of becoming part of an inclusive neighborhood in which social interactions between the residents with dementia and neighbors take place (Van Steenwinkel et al., 2017). The second concept contains small-scale living facility in or near a nursing home. Services and facilities of the nursing home can be used by the residents of the small-scale living, caregivers and visitors.

Although there is an increasing interest in the effects of physical interventions to stimulate informal social interaction, these interventions still have a static nature. Few examples can be found of smart (physical and technological) interventions. The importance of the context of the physical environment is large, such pilot studies which look at interventions in one specific location, sometimes yield conflicting results or assumptions. For example, the effect of small-scale housing versus the more traditional inpatient facilities is still debated and the beneficial effect of 'traditional' furniture has not been set off against the effects of 'modern' furniture.

## **Smart homes**

### **History of smart homes**

Under the influence of the rapidly developing technology, the concept of a 'smart home' has changed tremendously over the last decennium (Lui et al., 2011). Whereas smart living originally meant the use of electrical appliances aimed at automating processes in the home, now it is developing into a network of (sometimes embedded) technologies that communicate with each other (Mohammadi & Hammink, 2015). The development of smart homes is not only influenced by the development of technological possibilities, but also by societal influences and the stakeholders involved (Mohammadi, 2014). Technologically speaking, the first changes started during the industrial revolution, which allowed for mechanisation of the production process. Consumer goods could be produced faster and cheaper due to the assembly line and it wrought changes in society – where production of goods moved from homes to factory (Aldrich, 2003). This phase of mechanization was followed by electrification in which electrical applications for in the home were developed.

That being said, it took more than half a decade for these applications to be embedded in the homes and societies (de Rijk, 1998). The adoption of this technology was therefore not primarily technology driven, but mostly through changing in society. Important societal elements were the shortage of domestic help (Aldrich, 2003; de Rijk, 1998), connection of houses on the electrical grid (Mohammadi & Hammink, 2015) and resource scarcity in WWI (de Rijk, 1998). Whereas the adoption of time-saving household technology (such as vacuum cleaner) took rather long, the time-consuming appliances took hold very quickly. Technologies such as computers or televisions are thoroughly embedded in society nowadays (Bowden & Offer, 1994); another difference is that time-consuming technology changed the way people interact with each other within and outside the home. Not only became the television often a focal point in the home (spatially), it also impact social relationships, as neighbours and family without television visited their friends and family that did (Rooijen & Speet, 2009).

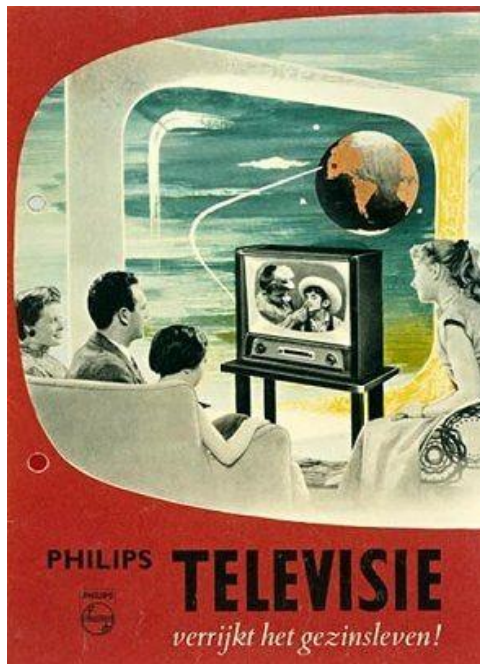


Figure 1 The television as central point in the home Translation: “television: an addition to family life!” (from: Rooijen & Speet, 2009)



## Present

### Current state of Smart Technology for Dementia

Smart home technology for older adults can be divided into several categories, specifically: health & care, safety & security, comfort & saving and social contact & self-development (Mohammadi, 2014). In the Netherlands, all inpatient facilities already employ some forms of these domotics, however the current state is that this smart home technology is mostly in the first three categories (Mohammadi, 2014).

International reviews show that for people with Mild Cognitive Impairment (MCI) some technologies are available that focus on safety & security, health monitoring (e.g. emergency alerts, monitoring, health information systems), activity monitoring and management and social support (e.g. through social robots and virtual platforms) (Blackman et al., 2016). These technologies are often not yet embedded in the physical environment and physical context that they have been put in. The reviews showed that from all the technologies reviewed, only one took into account social aspects and social interaction. This specific system was also aimed at detecting social interaction in the space (i.e. gathering data on social health of the inhabitant) (Bharucha et al., 2009; Kang et al., 2010). The other technologies found were cognitive orthotics, environmental sensors, physiological sensors and integrated sensor systems (Bharucha et al., 2009).

Furthermore, research has shown that the effect of these technologies on mental, physical or social health outcomes and/or quality of life has hardly been focused on (Bharucha et al., 2009; Blackman et al., 2016; Martin et al., 2008).

Although a large amount of research on smart home technology for people with dementia in inpatient facilities focuses on safety & security, comfort and health & care (monitoring), some exceptions can be seen. When looking at technological, non-pharmacological interventions for this target group one can see that there are some examples that either aim at stimulating social interaction or that report this as a (side)effect of the intervention, these interventions are often for people still living at home with dementia or more accurately, for their (informal) caregivers and are e-health or e-services that can facilitate social interaction. Of the smart home technology that focused on stimulating social interaction, three categories can be made. One is focussing digital reminiscence therapy (1), one on products from practice and design based for (sensory) stimulation (2) and social robotics (3). Below are the main findings from research on these three applications for people with dementia that aim at stimulating social interaction or have another functionality but report increased social interaction/social health as one of the effects of the intervention:

### *Digital Reminiscence Therapy*

Reminiscence therapy is a therapy to address the loss of personal identity of the person with dementia and it offers opportunities to perform the activity with other people, such as family members (Green, Guinn, & Smith, 2012). Constructing a story together offers the opportunity for social interaction, in turn increasing quality of life. There are some technological assistive means by which this therapy can be digitally supported. One is by offering non-skilled conversational partners help in executing these types of conversations (Green et al., 2012). Another aimed at collecting personal data from the person with dementia for a personal digital life story (Cohene et al., 2007) or personal digital life story using ambient biographical displays (Massimi et al., 2008). Yet another study aimed at using stories about the history of the place where the people were from (e.g. town where they grew up) to construct a digital story and to elicit stories related to personal identity (Gowans et al., 2004).

### *(Experimental) Products for Social Interaction*

From practice there are also some examples of (smart) products that stimulate interaction. These activities that are facilitated or stimulated are often -just like digital reminiscence therapy- based on therapy activities in care settings.

One example is a pillow that uses tactile feedback as a way to facilitate communication between family members and people with dementia who have lost the ability to speak. The design of the pillow aimed at stimulating muscular relaxation, physical movement and interpersonal contact (Schelle et al., 2015). It has been used in some care facilities in the Netherlands, but not clear research into the effects on have been done on a

large(r) scale. Another similar example is the CRDL (Cradle), a wooden egg that responds to touch and can emit vibrations and sounds. Personal testimonials and reviews show the positive valuations of family members and care givers, but not scientific research into the effects have been done yet (Schuivens, n.d.).

Another element aimed at stimulation is a piece of furniture aimed at stimulating people with dementia: a musical couch ('Muziekbank van Sandy Bruns voor mensen met dementie (Dutch)

·', n.d.). People with dementia can use the couch individually, but also as a group. It is aimed at creating a possibility for people to encounter each other, no extensive tests have been into its effect on social interaction.

Yet another example of a smart furniture piece that can work as stimulating element for people with dementia is the "tovertafel"/Active Cues project. The product can project on any surface and the projection reacts to movement from the person with dementia. In this case as well, no official evaluation on effect of social interaction has been done, but it has been implemented in over 40 care homes in the Netherlands already ('Tovertafel | De Zorginnovatie die beweging en plezier brengt', n.d.).

### *Social Robotics*

Although science fiction gives many applications of 'robots' and their possible benefits (or drawbacks), in practice they originated as 'artificial workers' and are associated with automating the production process (Mohammadi & Hammink, 2015). Robots can be seen as entities with artificial intelligence that interact with their environment in some way. Nowadays, one can not only see the rise of 'health care robots' but specifically of 'socially interactive robots', which primary task is to interact with their user in some form (Bemelmans, et al., 2012). The main application aimed at stimulating social interaction/social health through robots for older adults with dementia is through 'robotized pets'. It is similar to animal therapy (a well-known variant of stimulation therapy in care for older adults with dementia), but with for example a robotized seal, dog or cat (Shibata & Wada, 2011). Although there is growing literature in this area and increasing adoption in practice, there is little evidence as to the effectiveness of this therapy. A review of 17 studies into socially interactive robots (of which 12 with people with dementia) showed positive results in socio-psychological factors, although the methodological quality of these articles was, in general, low (Bemelmans et al., 2012).

#### **9.1.5. Social interaction through smart environments**

Our literature review shows that while there is quite some research on the effect of the physical environment on people (with dementia). The effect of the physical environment on a person's wellbeing and quality of life has been a focus of architects and designers through the ages and it has become a research field in its own right in the past decades (Jacobs, 1992). Through the demographic changes and the rise of the dementia in the large parts of the world the effect of the physical environment on the behaviour and well-being of people with dementia has come into focus. The emphasis of this research is often on improving wayfinding, reducing agitation and aggression. However, while the importance of social contact is recognized in nursing and social literature, the effect of the built environment on social interaction for people with dementia in inpatient facilities has been scarcely studied.

In the field of technology there is a rapid change going on facilitating the development of many new smart interventions for people with dementia in inpatient facilities. Although there are many smart interventions, these are often not integrated into the (built) environment, specifically the smart interventions for stimulating social interaction. The interventions that have been researched can be divided into three categories: (social) robotics and e- health/services. A development primarily seen in practice is the design and implementation of experimental stimulation products.

In the examined literature and best practices found there were very few examples of smart environments (smart technology integrated in the physical environment) for stimulating (informal) social interaction of people with dementia in inpatient facilities. The examples that were found can be divided into two categories: multi-sensory stimulation (snoezelruimte) and simulation spaces (e.g. beach room; train simulation). As multi-sensory stimulation rooms have been first introduced in the Netherlands around 1975, some research has been

done on the effect of these environments on the (behaviour of) people with a cognitive disability (Nasser et al., 2004). Some research has found that such a smart 'snoezel' environment can decrease social disturbance in the intervention groups examined (Topo, 2009). Although the results of different studies regarding the efficacy of 'snoezelen' are inconclusive, multi-sensory stimulation has been applied in many places (Van Hoof et al., 2010).

A development in practice is the emergence of 'simulation spaces', i.e. spaces that aim at creating an immerse environment for the person with dementia through the use of smart (integrated) technologies. Examples from these simulation spaces in the Netherlands are: the 'Beach room' in an inpatient facility in Amsterdam, which is a room with technological interventions such as (adjustable) lighting and temperature and non-technological interventions such as decoration, furniture and physical features such as sand (IDé, 2011). Although no official research has been done on the effect of the beach room, nursing staff and family indicate that there is increased social interaction in the beach room between residents, based on memories (related to the beach). Another example is the train simulation in an inpatient facility in Delft (IDé, 2008) and bus simulation in Haren ('Digitale bus voor mensen met dementie', 2015). Although also here no research has been done on the effect on social interaction, nursing staff indicate that not only residents interact with each other, but also visitors such as (grand)children enjoy using the simulation together. Lastly, an example from practice is the projection of different environments (with sounds) for older adults with dementia that is used in some inpatient facilities in the Netherlands. Depending on the module used it can be used for (guidance of) activities, which in turn can stimulate social interaction between residents ('Activiteiten voor de dementerende ouderen met Qwiek.up', n.d.). Also here, no research on the effect on social interaction has been done.

#### 9.1.6. Conclusion

Looking at the state of the art of smart environments for social interaction, we found literature on smart technology and architectural interventions for social interaction. There architectural tradition focussing on stimulation of encounters through the built environment. Although, research that focusses on design and dementia is increasing, these studies are often descriptive in nature or specific case studies or pilot projects on local spatial interventions and their effects. With the rise of technological possibilities more research is emerging suggesting the potential of smart technology for stimulating social interaction for people with dementia of an inpatient facility. Problematic in most of the studies is the influence if the specific context. What we mean to say is that the effect of different variables is hard to isolate and that there is a independency between physical, social and technological factors. For examples are, that the effect of a multi-sensory space do require a large effort on behalf of the caregivers (even though positive behavioural effects on people with dementia can be seen) as such the social context is crucial to the functioning of this space. Another example is the placement of smart technology in the physical environment. Even though a technology can provide its intended function, in order to create social interaction, the physical space needs to enable and not restrict encounters. En example can be the placement of a smart medicine dispenser in a thoroughfare hallway: it automates the distribution of medicine, however due to the location of the robot, there is too little space to interact and furniture and layout of the space do not invite people to linger.

Although stimulation of social health is crucial for people with dementia, as is shown by the rise of the positive health concept in care facilities, little research has been done on realizing smart environments for this target group. Some experimental smart environments can be found in practice, however research on their effects is scarce. The shift in care and social domains towards stimulation and prevention can already be seen in pilot projects in practice. In the Netherlands there seems to be the need to design and implement products and environments that stimulate the activities that they are still able to do, rather than support them in the things that they cannot do anymore.

However, new smart technologies can augment the effect of the built environment on social interaction. From other research on smart technology and architectural interventions, some important conditions on the design and implementation of smart environments for this target group emerge. The first important condition is the domestication of home technology: i.e. before technology can be successfully implemented in the living environment of a person with dementia, the technology is embedded and 'tamed' so that the feeling of home is preserved. This is even more important regarding the architecture of inpatient facilities in which a change from

institutional character of care facilities to more small-scale living concepts for people with dementia, in which a feeling of home is crucial, can be seen.

The effect of architecture on social interaction is well researched, in contrast to the impact of smart technology on social interaction. With the research that has been done only focusses on some specific areas of smart technology, leaving areas, such as second nature and internet of things for stimulating social interaction, out. The combination and integration of these two elements (architecture and smart technology) is still an under-researched domain. In current research the effects on social interaction often are a side effect rather than the main functionality. The effects of smart environments, but also smart technologies needs further investigation.

Lastly, with the implementation of smart environments for this target group ethical issues arise. By embedding smart technology in the environment, the technology is less visible and making it harder to circumvent using it. Furthermore data needs to be gathered in order for the system to respond adequately and empathically. Issues surrounding data security and privacy arise.

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## 9.2. Starosti prijazna in pametna bivalna okolja: Age-friendly and smart living environments

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### 9.2.1. Povzetek

Enaindvajseto stoletje bosta zaznamovala dva procesa – staranje prebivalstva in tehnološki razvoj. Staranje prebivalstva je najbolj izrazit demografski proces sodobne družbe. Zanj je povečanje deleža starejših v družbi in povečanje povprečne starosti prebivalstva. Čeprav pomeni staranje višek razvoja človeške družbe, pa hkrati postavlja družbo pred velike izzive – kako omogočiti kakovostno bivanje starajočega se prebivalstva. Po drugi strani so informacijsko-komunikacijske tehnologije postale del vsakdanjega življenja. In prav inovativne rešitve, ki temeljijo na novih tehnologijah, lahko omogočajo kakovostnejše življenje starejših. V članku so predstavljene inovativne rešitve za bivanje starejših in primeri dobrih praks, ki so povezane s tem.

**Ključne besede:** Staranje prebivalstva, Stanovanja, Inovativne rešitve, IKT, Pametni domovi

### 9.2.2. Abstract

The twenty-first century will be marked by two processes - an aging population and technological development. The aging population is the most prominent demographic process of modern society. It is an increase in the share of the elderly in society and an increase in the average age of the population. Although aging means an increase in the development of human society, it also puts society at the forefront of great challenges – how to enable a high-quality stay of the aging population. On the other hand, information and communication technologies have become part of everyday life. And innovative solutions based on new technologies can provide a better quality of life for the elderly. The article presents innovative solutions for living of the elderly and examples of good practices associated with it.

**Keywords:** Population ageing, Housing, Innovative solutions, ICT, Smart homes

### 9.2.3. Uvod

Prebivalstvo sveta, predvsem v razvitem delu, se intenzivno stara. Spremembe v demografski sestavi prebivalstva, kjer se zaradi različnih dejavnikov (rodnost, smrtnost, preseljevanje, migracije) povečuje delež starejših prebivalcev nad 60 oz. 65 let v celotni strukturi prebivalstva, vplivajo na vsa področja gospodarskega in družbeno-socialnega življenja. Ob spremenjeni demografski strukturi prebivalstva in ob vse večji brezposelnosti, so nujno potrebne spremembe na področju zaposlitve, upokojitve in pokojninskega sistema, kajti vse manjše število aktivnih ljudi dolgoročno ne bo moglo zagotoviti soliden življenjski standard za vse več starostnikov. Rešitev se kaže v čim daljši delovni dejavnosti zdravih, še sposobnih starejših ljudi. Z naraščanjem števila starejših prebivalcev se bodo povečevale potrebe po zdravstveni oskrbi, negi, tuji pomoči in institucionalnem varstvu, kot obliki nadomeščanja ali dopolnjevanja funkcije doma ali lastne družine. Družbene tendence in tudi želja večine starostnikov pa je tudi, da čim dlje bivajo v domačem okolju, v krogu svojih sorodnikov. Zaradi vse večjih stroškov povezanih s staranjem, bi v nastali situaciji morala družba s primernimi ukrepi omogočiti starostnikom, da čim dlje ostajajo v okrilju doma. Kljub obstoječim oblikam različnih družbeno organiziranih oblik pomoči starostnikom v domačem okolju, se nekateri, zaradi zdravstvenih in drugih okoliščin odločijo preživeti jesen življenja v institucionaliziranih ustanovah, kjer jim je omogočeno bivanje, organizirana prehrana, zdravstveno in drugo varstvo (Slonep, 2018). Spremembe v starostni strukturi prebivalstva terjajo ustrezne programe pri načrtovanju in reorganizaciji javne skrbi za starejše ljudi, tako na državni kot tudi na lokalni ravni ter čimprejšnje uvajanje in pripravo le-teh. Mnogi strokovnjaki pa opozarjajo, da rešitev ne smemo iskati v zagotavljanju potrebnih prostorskih zmogljivosti v okviru institucionalnega varstva, saj to dolgoročno ne bo vzdržno (Zimic, 2010). Takšna oblika dolgotrajne oskrbe in bivanja je namreč za državo in družbo zelo draga. Eden od odzivov družbe na te probleme je zamisel, da bi moralo biti starejšim ljudem zagotovljeno, da bi čim dlje ostali v domačem okolju, v katerem bi bili sposobni živeti čimbolj samostojno in kvalitetno. To bil lahko omogočile informacijsko-komunikacijske tehnologije (Kerbler, 2012). V članku so zato predstavljene inovativne rešitve za bivanje starejših, ki temeljijo na teh tehnologijah, in primeri dobrih praks, ki so povezane s tem.

### 9.2.4. Staranje prebivalstva

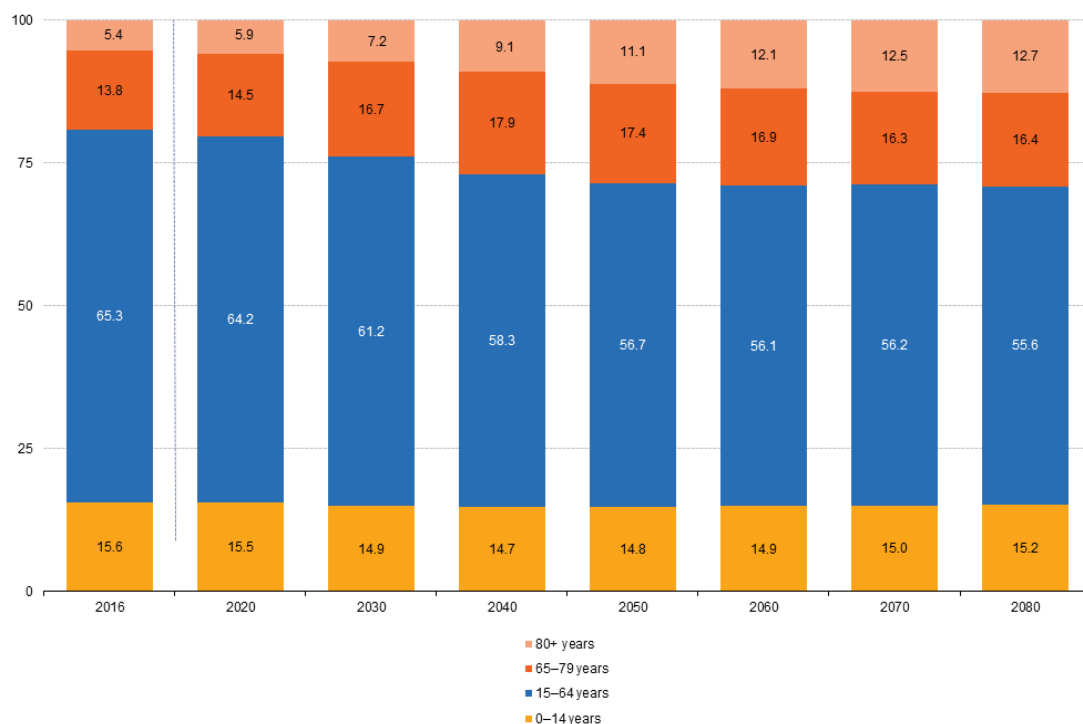
Evropa, kot tudi preostali razviti svet, se vse bolj sooča s problemom staranjem prebivalstva. Po poročilu Evropske komisije za staranje leta 2015 se bo prebivalstvo EU staralo. Število prebivalcev se bo tako v EU kot na globalni ravni skupno rahlo povečalo, in sicer iz 507 milijonov (leta 2013) na 526 milijonov ljudi do leta 2050, kar pomeni skoraj 5 % porast števila prebivalcev. V kar polovici držav članic Evropske unije (Bolgarija, Nemčija, Hrvaška, Španija, Litva, Latvija, Estonija, Madžarska, Poljska, Romunija, Slovenija, Slovaška in Portugalska) se pričakuje upad števila prebivalstva. Delež ljudi v EU, ki so starejši od 65 let bo v primerjavi z deležem prebivalstva med 15. in 64. letom narasel s sedanjih 27,8 % na 50,1 %. Po podatkih Združenih narodov se je med letoma 1950 in 2010 delež Evropejcev, starejših od 65 let, povečal iz 8,2 % na 16,2 %, stopnja prebivalstva pa naj bi se v prihodnje še povečala. Podobno je tudi v Sloveniji, saj je delež starejših od 65 let znašal 17,1 %, kar pomeni, da je bil že skoraj 3 % višji v primerjavi z deležem mlajšega prebivalstva (0–14 let). Če bo rodnost še naprej padala oziroma če ne bo stalnega ali vsaj večjega dotoka mlajših ljudi iz migracij, bo po napovedih Evropske komisije (2015) leta 2060 populacija starejših od 65 let pomenila že 29,3 % vsega prebivalstva članic Evropske unije ter Islandije, Lichtensteina, Norveške in Švice (Kerbler, 2014).

Nič drugače ni v Sloveniji. V državi je delež starejših že 19,1 % in bi se naj do leta 2060 dvignil na 31,6 %, kar bo glede na napovedi Evropske Komisije nad evropskim povprečjem, ki bo znašal 29,5 %. To pomeni, da bo vsak tretji Slovenec leta 2060 star vsaj 65 let. Ker bomo živeli dlje, se bo znotraj skupine starejših zato spremenila tudi struktura prebivalstva, saj se bo bistveno povečalo število starejših od 80 let, saj naj bi v naslednjih 30 letih podvojilo, do leta 2060 pa skoraj potrojilo. Slovenija glede tega ni izjema. Podatki Statističnega urada Republike Slovenije za leto 2017 kažejo, da se slovenska družba stara celo hitreje od evropskega povprečja. Delež starejših od 65 let se bo do leta 2060 povečal na 31,6 %, delež starejših od 80 let pa bo do takrat že presegel potrojitev. Povprečna pričakovana življenjska doba se bo v primerjavi s sedanjo do leta 2060 povečala na 84,8 let za moške in na 89,1 let za ženske (Statistični urad Republike Slovenije, 2017). Če bo nataliteta še naprej padala oziroma če ne bo migracij, bo po napovedih Eurostata leta 2060 populacija starejših od 65 let pomenila že 29,3 % vsega prebivalstva članic Evropske unije in držav EFTA. Zaradi nizke stopnje rodnosti in podaljševanja življenjske dobe se s pospešenim staranjem prebivalstva trenutno soočamo v najbolj razvitih državah, kjer se je med letoma 1950 in 2010 delež starejših od 65 let povečal iz 7,9 % na 15,9 %, do leta 2060 pa naj bi narasel na 26,2 %. Napovedi Združenih narodov kažejo, da se bo v prihodnosti zaradi hitrega upadanja rodnosti, ki je posledica uspeha reproduktivnega zdravja in programov načrtovanja družin, ta proces zelo pospešil tudi v manj razvitem delu sveta, zato bo čez pet

desetletij tam živelo že kar četrtnine vsega starejšega svetovnega prebivalstva. Delež starejših se bo v naslednjih petdesetih letih najbolj povečal v Aziji in Latinski Ameriki, in sicer glede na stanje 2010 za več kot trikrat. Za 2,3 krat večji bo v Afriki, vendar bo tam še vedno dokaj nizek (8,1 %). Čeprav bo med vsemi svetovnimi območji stopnja rasti starejšega prebivalstva v tem obdobju v Evropi in Severni Ameriki najnižja (delež starejših se bo povečal za 1,7 krat), bo še vedno največ ljudi, starejših od 65 let živelo v Evropi, in sicer 27,6 %. Ker bomo živeli dlje, se bo znotraj skupine starejših zelo spremenila tudi struktura, saj se bo bistveno povečalo število ljudi, starejših od 80 let. V razvitih državah se bo do leta 2060 delež tega prebivalstva povzpел iz 4,3 % na 10 %. Mnogo hitrejšo rast bodo beležile razvijajoče se države, saj naj bi se število starih ljudi v naslednjih petdesetih letih skoraj posedmerilo. Ključni kazalnik staranja prebivalstva je srednja starost, to je starost, ki deli populacijo v številčno dve enaki skupini oziroma pri kateri je polovica prebivalstva starejših in polovica mlajših od te starosti. Leta 2010 je na svetovni ravni srednja starost znašala 29,2 let čez petdeset let pa bo za deset let višja. Že leta 2010 je imelo srednjo starost več kot 40 let 19 držav, toda leta 2050 bo v to skupino spadalo že 99 držav (Kerbler, 2015).

Zaradi staranja prebivalstva, zlasti zaradi hitrega povečanja števila starih in slabotnih ljudi, ki praviloma potrebujejo zelo veliko nege in oskrbe, vse bolj narašča povpraševanje po zdravstvenih in socialnih storitvah in ustvarja vse večje stroškovne pritisk na obstoječi zdravstveni in socialni sistem. Čeprav je je finančna vzdržnost teh storitev že danes skrb vzbujajoča, se bodo po napovedih Evropske komisije, v prihodnje izdatki za pokojnine, zdravstveno varstvo in dolgotrajno oskrbo povečali za 4-8 % BDP, skupni stroški zdravstvenih in socialnih storitev pa naj bi se do leta 2050 potrojili. Samo za socialno varstvo naj bi v državah članicah Evropske unije leta 2050 delež stroškov znašal okoli 35 % BDP (Jespen in Leschke, 2008). V naslednjih desetletjih lahko utemeljeno pričakujemo, da se bo na področju zagotavljanja storitev za starejše pokazal učinek tako imenovane »baby boom« povojne generacije, ki bo v vse večjem obsegu postajala uporabnik storitev za starejše. Razmere kažejo, da se lahko zgodi, da bo v prihodnje primanjkovalo delovno aktivnega prebivalstva, iz katerega se napaja zdravstveni in socialni sistem (Kerbler 2011).

Slika 1: Struktura prebivalstva po glavnih starostnih skupinah, EU-28, 2016–2080



Note: 2016: estimate, provisional. 2020–80: projections (EUROPOP2015).  
Source: Eurostat (online data codes: demo\_pjangroup and proj\_15ndbims)

Vir: Eurostat (2016)

Glede na to, da se finančne zmožnosti držav, da bi zagotavljale sedanjo raven in obseg zdravstvenih in socialnih storitev zmanjšujejo, se vse bolj pojavljajo zahteve, da je treba storitve racionalizirati. Zahteva je uresničljiva z večjo ponudbo različnih oblik neinstitucionalnega bivanja kot so na primer gospodinske skupnosti v stanovanjih, stanovanjske zadrage, ena od oblik je tudi bivanje starejših v svojem domu, pri čemer je potrebno zdravstvene in

socialne storitve prenesti na kraj bivanja starejših ljudi. Raziskave namreč kažejo, da si želijo starejši čim dlje ostati v svojem domu, v istem in znanem okolju, poleg teh pa želijo, kolikor je le mogoče, ohraniti neodvisnost in samostojnost. Vse to je mogoče le, če so ljudje zdravi. Ko se pojavijo prevelika tveganja, zaradi česar je ogroženo njihovo zdravje ali življenje (na primer pozabijo jemati zdravila, nevarnost padca in podobno), pa so se prisiljeni preseliti v nadzorovano okolje, najpogosteje v okrilje institucionalnega varstva (Kerbler, 2011a).

Proces staranja prebivalstva in z njim povezane težave zagotavljanja vzdržnosti zdravstvene, socialne in stanovanjske oskrbe starejših ljudi postajajo vse večji izziv za razvite države, tudi za Slovenijo. Nove strategije za oskrbo starajočega se prebivalstva se zato vse bolj usmerjajo k selitvi oskrbovanih dejavnosti v domače okolje in s tem k podaljševanju bivanja starejših ljudi doma, kar je v skladu s težnjami in željami starejših. Le-ti si namreč želijo ostati čim dlje v svojem domu. Zamisel o selitvi zdravstvenih in socialnih storitev v domače okolje starejših ljudi je uresničljiva le z ustrezno prilagoditvijo infrastrukture in načinov njihovega izvajanja. Osnovo za to nudijo sodobne tehnologije, s pomočjo katerih je mogoče domača bivalna okolja starejših ljudi spremeniti v tako imenovane pametne domove. S selitvijo oskrbne dejavnosti na domove starejših ljudi je potrebno zagotoviti učinkovito izvajanje storitev in njihovo kakovost vse povezano s prilagajanjem bivalnega okolja z uvajanjem novih organizacijskih postopkov ter tehničnih in tehnoloških rešitev. Tako pomembne spremembe v starostni strukturi prebivalstva terjajo ustrezne programe pri načrtovanju in organizaciji javne skrbi za starejše ljudi, tako na državni kot na lokalni ravni ter čimprejšnje uvajanje in pripravo le-teh (Kerbler, 2013).

Razvoj sodobnih tehnologij in staranje prebivalstva v razvitih državah sta vzporedna in med seboj povezana procesa, saj se z novimi metodami diagnosticiranja in zdravljenjem podaljšuje življenje, sodobne tehnologije pa po drugi strani nudijo starejšim podporo pri življenju in bivanju. Podaljševanje trajanja življenja predstavlja enega največjih dosežkov družbe, ki pa po drugi strani postavlja človeštvo pred nove izzive in dileme. Skupaj z daljšanjem življenjske dobe v svetu vztrajno narašča število starejših ljudi s kognitivnimi, senzornimi in mobilnostnimi težavami ter s kroničnimi obolenji, kar posledično ustvarja neprizanesljive stroškovne pritiske na obstoječe zdravstvene in socialne sisteme. Z razvojem informacijske družbe je to uresničljivo s pomočjo informacijskih in komunikacijskih tehnologij (IKT), s pomočjo katerih je oskrba na domu zagotovljena na daljavo – t.i. teleoskrba (ang. telecare). Gre za sistem, pri katerem so domača bivalna okolja starejših ljudi na daljavo povezana z nadzornim centrom in preko njega z zdravstvenimi in negovalnimi centri (Kerbler 2011a, 2013).

#### **9.2.5. IKT rešitve in možnosti za neodvisno staranje**

Z razvojem informacijske družbe se je pojavila ideja, da se oskrba in druge povezane aktivnosti za starejše s pomočjo tehnologije premakne oziroma prenese v njihove domove (Kerbler, 2012). IKT imajo velik potencial za to, da se zagotovi bolj kakovostna oskrba (na daljavo) in se starejšim omogoča zdravo in aktivno staranje. Tovrstna tehnologija lahko podaljša kakovost življenja, podaljša življenje pripomore k izboljšanju telesnega in duševnega zdravja, preprečujejo nastanek resnih zdravstvenih težav, poleg tega pa lahko zmanjšamo breme družin, oskrbovalcev in družbe (Samar Brenčič, 2012). IKT v povezavi z medicino, zdravjem in nego se v literaturi IKT v povezavi z medicino, zdravjem in nego se v literaturi pojavlja pod izrazi telemedicina (ang. telemedicine), telezdravje (ang. telehealth) in teleoskrba (ang. telecare) (povzeto po Sušin, 2015).

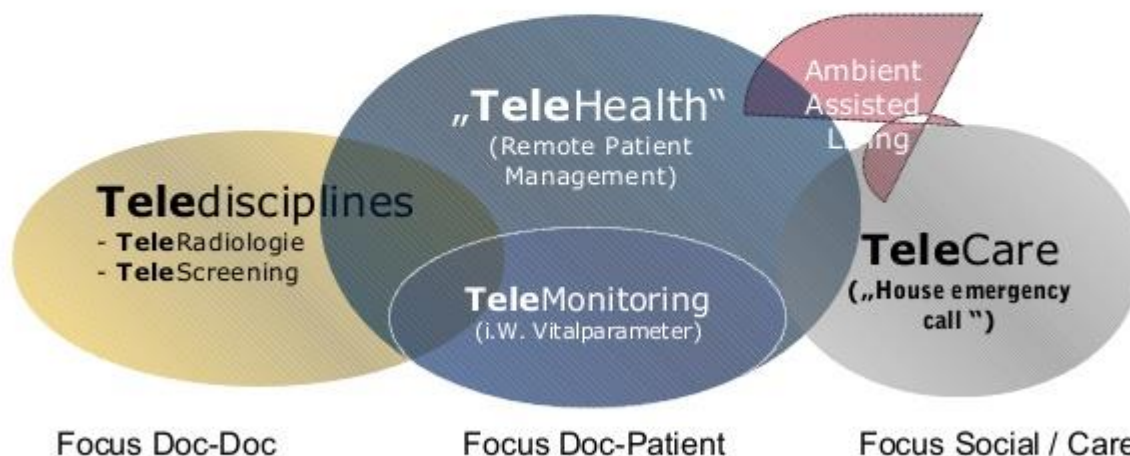
Telemedicina pomeni zagotavljanje zdravstvenih storitev z uporabo IKT v primerih, ko sta izvajalec zdravstvene storitve in pacient oziroma dva izvajalca zdravstvene storitve prostorsko ločena (Rudel idr., 2011). Evropska komisija poudarja, da lahko telemedicina bistveno pripomore k boljšemu življenju evropskih državljanov, zdravstvenim delavcem lahko ponudi nova orodja za soočanje z izzivi, s katerimi se srečujejo zdravstveni sistemi (Rudel in Stojan, 2010). Definicije telezdravja so zelo različne in so precej prepletene z definicijami telemedicine. V Evropi naj bi bil telezdravje krovni izraz za širši spekter tehnologij, kar vključuje tudi telemedicino, e-nego, teleoskrbo itd. Tudi Rudel in drugi (2011) razumejo telezdravje kot skupek tehnologij in povezanih storitev na daljavo, ki so dostopne ljudem in njihovim skrbnikom na domu ali v širši skupnosti z namenom njihovega opolnomočenja, ocenjevanja ali zagotavljanja oskrbe in podpore glede vsega, kar se nanaša na njihovo zdravje. Telezdravje tako pomeni zagotavljanje kakršnihkoli, z zdravjem povezanih storitev na daljavo in tako predstavlja razširitev pojma »telemedicina. Prepletenost izrazov na področju storitev za zdravstvo na daljavo lepo pokaže tudi slika 2 (povzeto po Sušin, 2015).

Slika 2: Kaj je telemedicina?



## The Bigger Picture - What is Telemedicine?

Telehealth/medicine:  
delivery of healthcare services by use of Information and Communication Technologies (ICT)  
while actors are not at the same location.



Telemedicine Focus Group

2nd

page 4

Vir: Rudel idr. (2011), povzeto po Sušin (2015)

Danes živimo v svetu, ki se izjemno tehnološko razvija. Z razvojem sodobnih informacijskih in komunikacijskih tehnologij (IKT) se odpirajo nove možnosti in rešitve. S pomočjo IKT tehnologije je omogočen nadzor nad dogajanjem v okolju in nadzor bioloških funkcij uporabnika, tudi varovanje uporabnika. Pametni dom je sistem, ki se odziva na potrebe in dejavnosti ljudi in je prilagojen človekovim kognitivnim in fizičnim sposobnostim (Pecora in Cesta, 2007). Taki pametni domovi so opremljeni z najsodobnejšo opremo, pripomočki in tehnologijo, ki so med seboj funkcionalno povezani. Elektronski sistemi v pametnem domu omogočajo nadzor nad bivalnim okoljem in izvedbo določenih opravil (odpiranje in zapiranje vrat, dviganje zaves, vklop in izklop ogrevanja in podobno) z minimalno fizično silo na različne načine (daljinski upravljalnik, govorni ukaz, nadzorna plošča na primer invalidskem vozičku, celo z gibanjem očesnih zrkel in podobno). Kot navajajo (Zupan idr., 2007) je v takih domovih vgrajena komunikacijska tehnologija, ki omogoča e-dostopnost in e-vključenost z različnimi okolji – grajenim okoljem v obliki zgradb in družbene infrastrukture, s socialnim okoljem (interakcija z bližnjimi, s sosedi, z ponudniki storitev) in sekundarnim okoljem – kultura, politika, ekonomija, ekologija in podobno (povzeto po Kerbler, 2011b).

Kljub navedenemu pa pametni dom tudi ob najboljši tehnični in tehnološki dovršenosti sami po sebi ne more služiti svojemu namenu, če bivalni prostor ni že v osnovi ustrezno fizično preurejen – biti mora namreč brez arhitekturnih ovir in prilagojen za bivanje starejšega človeka glede na njegove potrebe, zmožnosti in zahteve – na primer razporeditev prostorov mora biti čim bolj funkcionalna, prehodi med prostori morajo biti brez pragov, površina tal mora biti ravna in nedrseča, dimenzije vrat in prehodov (hodnikov) morajo biti širše, primerna mora biti višina pohištva, električnih inštalacij, oken itd., kopalnice in sanitarni prostori morajo biti opremljeni z držali, sedali, naslonjali in z ustrezno prilagojeno opremo, osvetlitev prostorov mora biti zadostna, primerne morajo biti tudi (svetle) barve in njihovi kontrasti ter podobno. Pametni domovi so torej kombinacija bivalnega okolja brez arhitekturnih ovir ter podpornih in informacijsko komunikacijskih tehnologij, vgrajenih v takšno bivalno okolje (Kerbler, 2011a).

Na področju pametnih domov je v Evropi (na primer skandinavske države, Nizozemska, Velika Britanija, Nemčija, Italija, Francija) in drugod po svetu (na primer ZDA, Japonska, Južna Koreja in Singapur) v teku več projektov. Predvsem na Nizozemskem in Finskem se delež inteligentnih naprav v novih hišah in stanovanjih za starejše povečuje. V Sloveniji so na Inštitutu Republike Slovenije za rehabilitacijo so v letu 2008 pripravili demonstracijsko okolje pametnega doma. To je tako imenovani Dom IRIS (Inteligentne Rešitve in Inovacija za Samostojno življenje), vendar v primerjavi z drugimi takimi okolji po svetu, bivanje v njem ni mogoče. Gre namreč za demonstracijsko in učno okolje za izpopolnjevanje različnih rešitev, ki so namenjene samostojnejšemu in kakovostnejšemu življenju v domačem okolju. Vsi bivalni prostori so arhitekturno prilagojeni predvsem gibalno oviranim osebam. Tla so brez neravnin in pragov, ki bi ovirali uporabnike invalidskih vozičkov. Pri vratih je poskrbljeno za ustrezno širino, stikala pa so nameščena ustrezno nizko na stenah. Pohištvo je v veliki meri nastavljivo po višini, drogovci za obešanje oblačil v omarah se spustijo. Slabovidnim je v vseh prostorih v pomoč kontrastna črta, ki vodi skozi stanovanje oziroma prostor. V bivalnem prostoru je nameščena oprema in različni tehnološki pripomočki, od preprostih do najzahtevnejših, ki starejšim in invalidnim osebam z različnimi vrstami invalidnosti omogočajo najvišjo stopnjo funkcionalne samostojnosti in neodvisnosti bivanja (Zupan idr., 2007). Starejši in invalidne osebe lahko prek napotnice splošnega zdravnika ali samoplačniško obiščejo to bivalno okolje in preizkusijo najnovejše pripomočke in tehnologijo – ki jim omogočajo samostojnejše in varnejše bivanje v domačem okolju – ter jih glede na svoje potrebe in zmožnosti prenesejo v vsakodnevno življenje in domače okolje. Letno v njem obravnavajo približno 200 pacientov, prevladujejo pa invalidne osebe (povzeto po Kerbler, 2011a).

Največ raziskav na področju pametnih domov, se nanaša na uresničitev zamisli o selitvi zdravstvenih in socialnih storitev v domača okolja starejših ljudi oziroma kako domača okolja, ki so urejena po konceptu pametnih domov, čim učinkoviteje povezati v omrežje »oddaljenega nadzora«, s čimer so lahko oskrba in druge zdravstvene storitve zagotovljene na daljavo. Slovenija zelo zaostaja za drugimi državami pri zagotavljanju storitev na daljavo s pomočjo preprostih sistemov. V svetu potekajo raziskave, ki so raziskave osredotočene v razvoj in delovanje naprednejšega sistema pametnih domov. Sistem deluje tako, da senzorji, ki so vgrajeni v domačem (pametnem) okolju uporabnika na diskreten način (na primer na kljukah, ročajih, ročnih urah in podobno), spremljajo življenjski cikel uporabnika, in sicer:

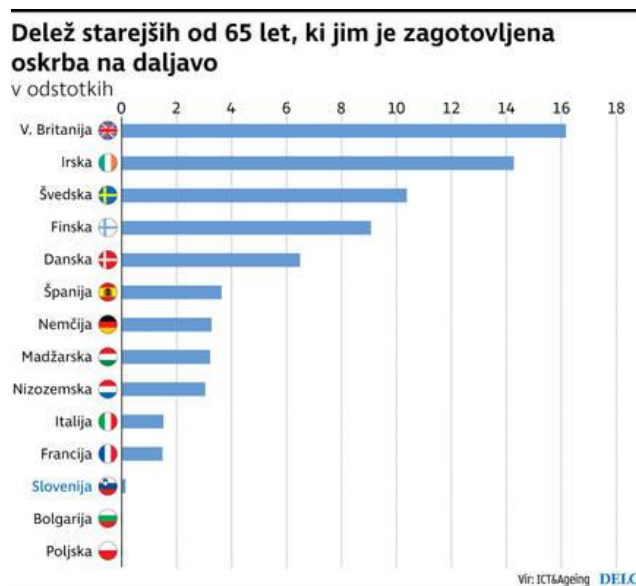
- meri uporabnikove fiziološke funkcije (srčni utrip, krvni tlak, vlažnost kože, stopnjo sladkorja v krvi, telesno težo, temperaturo telesa, stopnjo ogljikovega dioksida v izdihanem zraku, šume v telesu, izločanje seča in blata in podobno)
- zaznava uporabnikovo delovanje (spremljanje počasnih in trajnih sprememb v življenjskem stilu, ocenjujejo vedenjski vzorec opazovane osebe, in sicer na podlagi števila prehodov skozi vrata, pogostosti odpiranja vrat hladilnika, frekvence stopanja na preprogo pred posteljo, čas hranjenja in število obrokov in podobno)
- uporabniku s kognitivnimi in/ali senzoričnimi pomanjkljivostmi prenašajo opozorila (na primer ko je čas za jemanje zdravil, zvočna navodila pri upravljanju v prostoru); omogočijo in beležijo socialno interakcijo (video povezave za vzdrževanje stikov s sorodniki, prijatelji in z znanci in za virtualno sodelovanje pri skupnih aktivnostih).

Poleg teh naprav, ki spremljajo stanje uporabnika, so v pametnem domu vgrajene tudi naprave, ki ugotavljajo nenavadno stanje ali nenavadne razmere v bivalnem okolju ter tako zagotavljajo varnost in nadzor – mednje spadajo detektor gibanja (za zaznavanje padca, za samodejno prižiganje/ugašanje luči in odpiranje vrat), detektor ognja, dima ali plina, detektor izliva vode in podobno. Vse informacije se prenašajo in beležijo v oddaljenem informacijskem (nadzornem) sistemu. Če sistem zazna kakršne koli spremembe, ki odstopajo od normalnih parametrov uporabnika oziroma stanja v njegovem bivalnem okolju, samodejno sproži alarm, ki se prenese v klicni (alarmni) center (k oddaljenemu skrbniku), ta pa se ustrezno odzove v uporabnikovem domačem okolju. Glede na vrsto in obseg težave odgovorna oseba, ali da ustrezna navodila (priporočila) uporabniku (na primer jemanje zdravil, obisk pri zdravniku in podobno) ali pa o potrebi uporabnika obvesti javno službo oziroma izvajalce storitev – na primer patronažna služba, urgentna medicinsko pomoč, gasilce in podobno (Kerbler, 2012).

V ZDA obstaja tudi že več ponudnikov naprednejših sistemov IKT, ki v domačem bivalnem okolju zajemajo podatke o vitalnih življenjskih funkcijah ter jih prek hišnih omrežij in širokopasovnih komunikacijskih poti prenašajo v posebne zdravstvene in negovalne centre. Pri poskusu vzpostavitve oziroma implementacije aplikativnih oblik ambientalne inteligence v državi pa ima na svetu trenutno glavno vlogo Velika Britanija. V Angliji, Walesu, na Severnem Irskem in Škotskem so med letoma 2006 in 2011 izvedli več pilotnih projektov, s

katerimi so želeli pridobiti čim več praktičnih izkušenj in dokazov, na podlagi katerih bi lahko implementacijo uspešno izvedli z večjo gotovostjo. Rezultati so zelo spodbudni. Na Škotskem, na primer, so na en funtov vloženih stroškov za vzpostavitev, razvoj in izvajanje sistema prihranili kar šest funtov (Joint Improvement Team, 2010), in sicer na račun zmanjšane števila sprejemov v zavode institucionalnega varstva, zmanjšane števila nepotrebnega bolnišničnega bivanja (zaradi hitrejšega odpusta in nadomestne poboljšane oskrbe na daljavo), števila nepričakovanih sprejemov v bolnišnico (zaradi hitre odzivnosti sistema pri poškodbah v domačem okolju) ter na račun zmanjšanja števila nočnih dežurstev in obiskov na domu (povzeto po Kerbler, 2011a).

Slika 4: Delež uporabnikov oskrbe na daljavo po Evropi



Vir: Internet 1

Raziskave na tem področju bi se zato morale bolj osredotočiti na uporabnike, pri čemer s tem nimamo v mislih le oskrbovancev, ampak tudi neformalne in formalne skrbnike, torej tisto ciljno občinstvo, ki na koncu dejansko sestavlja »trg« za pametne domove. Uporabniki sami bi morali ovrednotiti značilnosti in učinke tehnologij, in sicer na podlagi tega, kako jih dojemajo oziroma zaznavajo – kot pomembne oziroma nujne ali pa kot nezaželene. Na podlagi dovolj velikega števila tovrstnih raziskav (in s tem uporabniških izkušenj) bi bilo mogoče posplošiti način dojemanja oziroma zaznavanja uporabnikov, kar bi bilo v pomoč oblikovalcem tehnologij in pametnih okolij, s čimer bi se najverjetneje povečal uspeh implementacije pametnih domov. Da pa bi lahko uporabniki tehnologije stvarno ovrednotili, menimo, da mora biti pri procesu implementacije glavni cilj osmišljanje in razumevanje koncepta pametnega doma. Uporabnike od koncepta pametnih domov najpogosteje odvrča avtomatiziranost oziroma dojemajo tehnologijo kot zamenjavo za osebne oblike oskrbe, varstva in komunikacije, kar bi lahko imelo za posledico zmanjšanje socialne interakcije in izoliranosti. Za starejše ljudi je že v splošnem značilno, da jih je strah inovacij in novih tehnologij (Sponselee idr., 2008). Starejši ljudje so konservativnejši in ne želijo, da bi se njihovo življenje in življenjske navade preveč spreminjale, še zlasti ne zaradi zunanjih, manj znanih, tujih dejavnikov, ki lahko posegajo v njihovo zasebnost. Strah pred tehnologijami pa imajo tudi skrbniki. Poleg tega, da se jim lahko zdi podpora bivanja starejših s pomočjo tehnologij neosebna, imajo odpor do njih tudi zato, ker se, kot navajajo (Raappana idr., 2007), bojijo, da se bodo zaradi tega morali (delno ali v celoti) odpovedati svoji vlogi, vlogi skrbnika, za kar se, (zlasti) formalni skrbniki, čutijo poklicane. Po navedbah avtorjev navedeni strah pogosto izhaja iz tega, da imajo skrbniki premalo znanja o uporabi tehnologij oziroma dojemajo priučevanje za delo z njimi kot dodatno, nepotrebno in stresno obveznost. Če bi torej uporabniki razumeli delovanje tehnologij, spoznali njihove prednosti in koristi ter se jih naučili uporabljati, bi strah pred njimi izgubili, s tem pa bi jih tudi sprejeli kot del svojega življenja in dela (povzeto po Kerbler, 2011a).

Namestitvene zmogljivosti v oskrbnih institucijah so zelo omejene, zaradi česar nastajajo dolge čakalne vrste, po drugi strani pa sodobni ritem in način življenja vse bolj omejujeta možnosti za družinsko in domačo oskrbo



starejših družinskih članov. Domači skrbniki zato od pametnih tehnologij pričakujejo, da jih bodo lahko nadomestile in popolnoma razbremenile, kar je utopično in nevarno, tako za oskrbovance, ki bi lahko dejansko postali družbeno izolirani, kot tudi za uspešnost implementacije pametnih domov, saj bi lahko razočaranje, ki bi sledilo spoznanju, da človek vendarle ni nadomestljiv s tehnologijami, vodilo do odpora in širjenja negativnega mnenja glede koncepta pametnih domov v družbi. Uporabniki bi zato morali biti natančno poučeni, kakšne so dejanske zmogljivosti pametnih tehnologij, in imeti glede njih realna pričakovanja, proizvajalci in oblikovalci pa bi morali biti iskreni glede njihovih zmogljivosti. Pomen ozaveščanja uporabnikov za uspeh implementacije potrjujejo tudi rezultati poskusov implementacije pametnih domov na Škotskem. Tam se je namreč med letoma 2007 in 2010 za vključitev pametnih tehnologij v domače okolje, vključitev v omrežje »oddaljenega nadzora« in prek njega povezavo z izvajalci oskrbe in drugih storitev odločilo kar 25 % novih uporabnikov (glede na začetno stanje), kar potrjuje učinkovito informiranje (Joint Improvment Team, 2010). Kot navajajo (Beale idr., 2010) so za nadaljnjo delo zelo pomembni tudi rezultati anketiranja med uporabniki – oskrbovanci na eni strani in njihovimi skrbniki na drugi. Kar 60,5 % oskrbovancev je namreč menilo, da se je s preureditvijo doma v pametno okolje ter z vključitvijo v oskrbo in varstvo na daljavo njihova kakovost življenja izboljšala, 93,3 % oskrbovancev je menilo, da so zaradi tega varnejši, in 69,7 %, da so samostojnejši, kar 87,2 % pa jih je izjavilo, da imajo zato drugi družinski člani manj dela in skrbi z njimi. Da so nove tehnologije lahko v pomoč tudi neformalnim skrbnikom, potrjujejo tudi izjave svojcev, kar 74,3 % jih je namreč menilo, da so zaradi njihove uporabe manj obremenjeni. Vzpodbudni so tudi rezultati raziskav o uporabniški izkušnji s pametnimi domovi pri starejših ljudeh, ki trpijo za demenco (povzeto po Kerbler, 2011a).

Tehnologije, ki bi torej zmanjšale in ublažile tako finančne in čustvene posledice demence, so torej več kot dobrodošle, vendar pa mora biti njihova zasnova in uporaba posebej prilagojena potrebam in zmožnostim dementnih ljudi. Ti se namreč zelo težko učijo novih nalog in postanejo zelo zmedeni in prestrašeni, če so soočeni z kakršnim koli novim predmetom oziroma opremo. Pri oblikovanju pametnih okolij za starejše z demenco je pomembno, da tehnologija ne posega v njihove vsakodnevne dejavnosti – vse naprave morajo delovati samostojno in biti povsem nemoteče. Najpomembneje je, da morata biti njihovo delovanje in uporaba nujno povezana s oskrbo in podporo skrbnikov. Pametni domovi so torej v primerih, ko gre za oskrbo starejših z demenco, predvsem v pomoč in razbremenitev skrbnikov. Eden od tovrstnih naprednih sistemov, ki so jih razvili v Veliki Britaniji, se imenuje Just Checking. Sistem pametnega doma ni povezan z oddaljenim nadzornim centrom, ampak omogoča nadzor skrbniku (na primer družinskemu članu), da lahko spremlja in preverja oskrbovančev vzorec obnašanja in vedenja. Skrbniku zato ni treba prekinjati oskrbovančeve vsakodnevne rutine in »vdirati v njegovo zasebnost« z interventnim preverjanjem oskrbovančevega stanja in obnašanja, ampak to naredi le takrat, ko na podlagi podatkov, ki jih sistem nudi, presodi, da je to res potrebno. Obiski pri oskrbovancu tako postanejo socialne in ne preventivne narave. Uporabniki so s sistemom zelo zadovoljni, njihovo število pa stalno narašča. Na področju oskrbe na domu na daljavo potekajo v tujini obsežne raziskovalne in razvojne dejavnosti ter strateški in pilotski projekti. Zlasti v Veliki Britaniji in Združenih državah Amerike že obstaja vrsta ponudnikov sistemov, ki zajemajo podatke o vitalnih življenjskih funkcijah ter jih prek hišnih omrežij in širokopasovnih komunikacijskih poti prenašajo v posebne zdravstvene in negovalne centre. Razvoj sistema oskrbe na domu na daljavo je Evropska unija sprejela tudi v strateških dokumentih (Kerbler, 2011a).

#### 9.2.6. Primeri dobrih praks<sup>20</sup>

Na evropski ravni se je že začelo konkretno ukrepanje na področju aktivnega in zdravega staranja. Vedno več se o tem govori, vedno več je projektov in partnerstev, katerih namen je poiskati inovativne rešitve za spopadanje z izzivom starajoče se Evrope. Tako so se začela ustanavljati tudi Evropska partnerstva za inovacije (ang. European Innovation Partnership), ki predstavljajo nov pristop Evropske komisije k raziskovanju in prenavljanju ukrepov na določenih področjih. Namen ustanovitve partnerstev je poenostaviti in bolje uskladiti že obstoječe iniciative, jih dopolniti, če je to potrebno, predvsem pa omogočiti, da partnerji lažje sodelujejo in tako dosegajo boljše rezultate. Partnerstvo namreč povezuje vse relevantne akterje iz Evropske unije, na nacionalnem in regionalnem nivoju, da bi se spoprijeli s specifičnim socialnimi izzivi.

Kot enega izmed družbenih izzivov, ki je skupen vsem evropskim državam, je Evropska komisija prepoznala dejavno in zdravo staranje prebivalstva. Da bi začeli reševati ta izziv, so leta 2011 ustanovili Evropsko partnerstvo

<sup>20</sup> Poglavje povzeto po Sušin (2015, str. 16–28).

za inovacije za dejavno in aktivno staranje (ang. European Innovation Partnership on Active and Healthy Ageing). Cilj partnerstva je do leta 2020 povečati zdravo življenjsko dobo državljanov EU za dve leti, obenem pa doseči trojno zmago (ang. triple win) za Evropo: izboljšanje zdravja in kakovosti življenja starejših, izboljšanje vzdržnosti in učinkovitosti sistemov oskrbe ter nove priložnosti za rast podjetij in njihove tržne priložnosti. Gre za partnerstvo, ki združuje deležnike z različnih področij tako iz javnega kot tudi iz zasebnega sektorja. Sodelujejo za skupni interes, aktivnosti in projekte, da bi poiskali inovativne rešitve, ki se tičejo potreb starajoče populacije. Uspeh partnerstva je odvisen od vključenosti naslednjih partnerjev: vlade, univerze in raziskovalne skupine, javnih organov na državni, regionalni in lokalni ravni, izvajalcev zdravstvenih in oskrbovalnih storitev, podjetij ter organizacij, pacientov, upokojencev in starejših. Deležniki, ki so se vključili v različne projekte, so določili tri ključna področja, na katerih je potrebno takojšnje ukrepanje:

- preventiva in zgodnje diagnosticiranje,
- nega in zdravljenje,
- aktivno staranje in neodvisno življenje starejših.

Dobre prakse predstavljajo inovativne primere in pristope k aktivnemu in zdravemu staranju. Gre za koalicije regij, mest, povezanih bolnišnic ali organizacij za oskrbo, ki kažejo svoj vpliv in inovativne rešitve, ki bi lahko bile razširjene tudi na druga evropska področja. V nadaljevanju bodo navedeni primeri referenčnih strani iz različnih držav Evrope:

1. Mesto Oulu na Finskem predstavlja kar tri dobre prakse. Prva je spletno orodje »Wellness Profile Oulu«, s katerim lahko starejši ocenjujejo svoje fizično in psihično zdravje, svojo neodvisnost, osamljenost, varnost, socialno mrežo, ter orodje »Oulu Self-Care System«, s katerim se lahko naročijo v laboratorij, pregledajo rezultate testiranja, pošiljajo in prejema sporočila in vnašajo meritve, ki so jih sami opravili doma itd. Sistem je sicer še v razvoju, vendar pa pričakujejo, da bo ta močno pripomogel k zgodnjemu odkrivanju težav in bodo tako prej dobili ustrezno oskrbo. Druga dobra praksa so nove aplikacije in storitve preko e-orodij, ki bodo pomagala podpirati neodvisno življenje starejših v lastnem domu. Njihov strateški cilj je, da bi večina starejših od 74 let živeli v domovih, ki bi imeli implementirana inovativna IKT-orodja. Predvidevajo, da bi se s tem pri starejših močno povečal občutek varnosti in neodvisnosti. Tretja novost pa je »LivingLab«; gre za odprto okolje za razvoj in testiranje izdelkov in storitev za življenje starejših, ki bi jih lahko potem prevzela podjetja in organizacije. Namenjen je torej predvsem podjetjem, ki skupaj s starejšimi razvijajo tehnologijo, s pomočjo katere bi lahko čim dlje živeli doma.
2. Svet regije Lower-Rhine v Franciji je vpeljal inovativno politiko za aktivno in neodvisno staranje, saj želijo raziskati potencialne inovativne rešitve, vključno z IKT, z namenom, da starejši čim dlje ostanejo doma. Naredili so študijo primera »Stanovanje za jutri«, s katero so pokazali, kako preurediti hišo, da se prepreči funkcionalno in kognitivno nazadovanje. Rezultat pilotne študije je boljše razumevanje trga, s čimer je tako uporabna predvsem za zainteresirana podjetja. Prav tako pa je projekt povezal javne in zasebne partnerje.
3. Ministrstvo za socialne zadeve in varstvo potrošnikov Saxon v Nemčiji predstavlja tri dobre prakse. Prva je »geriatrični koncept«, ki združuje geriatrične centre, bolnišnice, specialiste, zdravnike, rehabilitacijski centre, domove, občine in socialne storitve ter predvideva kakovostno in učinkovito oskrbo, zdravljenje in rehabilitacijo pacienta čim bližje njegovemu domu. Druga praksa je izboljšanje oskrbe pacientov z diabetesom z uporabo medicine na daljavo (na primer elektronsko zapisovanje vsake meritve krvnega sladkorja). S to prakso so zagotovili boljšo oskrbo sladkornih bolnikov in hitrejšo pomoč, če je bilo to potrebno. Tretja dobra praksa pa je projekt »Living the age«, s katerim skušajo prenoviti domove (vpeljava podpornih tehnologij) v regiji tako, da bodo ustrezala potrebam starajočega prebivalstva. S tem skušajo doseči, da bi starejši preložili ali se celo izognili življenju v institucionalni oskrbi.
4. Sodelovanje na področju staranja na Irskem (COLLAGE) je iniciativa, ki predstavlja tri dobre prakse. CARTS (Community assessment of risk and treatment strategies) skuša odložiti ali preprečiti pešanje in šibkost ter tri učinke tega: institucionalizacijo, hospitalizacijo in smrt. Uporablja hitro selektivno orodje, ki pomaga identificirati težave in razumeti tveganje ter potem definirati najbolj učinkovito intervencijo za

pacienta. CARST zajema štiri področja za ocenjevanje: mentalno stanje, aktivnosti dnevnega življenja, zdravstvene težave in družbeno – ekonomske skrbi. S tem enostavnim orodjem lažje pridejo do tistih, ki so pod tveganjem za določene bolezni, ti pa bodo dobili ustrezno pomoč, prej bodo lahko odšli iz bolnišnice itd. Louth je prvo okrožje na Irskem, kjer so razvili in vpeljali starosti prijazen akcijski načrt: LAFCI – louth age friendly county initiative, kar je predstavljeno kot druga dobra praksa. Njihovi cilji so izboljšati zdravje starejših, povečati participacijo starejših v skupnosti in omogočiti potrebne storitve s pomočjo stroškovno učinkovitih partnerstev. Akcijski načrt predstavlja temelj za razvijajoče se politike v zvezi z aktivnim in zdravim staranjem, saj zagotavlja sodelovanje različnih deležnikov. Tretja dobra praksa pa je program za napredno načrtovanje celostne nege »Let me decide«, kjer lahko starejši aktivno sodelujejo pri vprašanjih, ki se tičejo oskrbe v poznem življenjskem obdobju oziroma v težkih zdravstvenih okoliščinah, ko ne bodo mogli več povedati svojih želja.

5. Tudi regija Emilia Romagna v Italiji predstavlja dve dobri praksi. Prva je SOLE (healthcare online) in EHR (Fascicolo sanitario elettronico FSE Emilia-Romagna), katerih namen je ustvariti enotno omrežje lokalnih zdravstvenih služb, bolnišnic, splošnih zdravnikov in pediatrov, ki bi vnašali podatke v EHR (»electronic health record«), s čimer bi bili vsi zdravstveni podatki vsakega posameznika na voljo od otroštva naprej. To lahko pomeni manj napak zdravnikov, boljše in hitrejšo oskrbo itd. Rezultati so v zmanjševanju stroškov tako pri zdravstvenih storitvah, kot tudi v administrativnih zadevah. Druga iniciativa je namenjena preprečevanju padcev »PROFITER«, ki hoče ustanoviti regionalno omrežje za digitalizacijo in analizo informacij, povezanih s padci. Vpeljujejo tudi inovativne pripomočke – naprave, ki temeljijo na IKT in zaznavajo padce. To pomeni, da je ukrepanje, ko pride do take situacije, hitrejše, bolj učinkovito, starejši manj dni preživijo v bolnišnici in s tem se zmanjšajo tudi stroški.
6. Univerza Coimbra iz Portugalske predstavlja tri dobre prakse. Skupina za zgodnje odkrivanje kognitivnega staranja, demenco in oslabitve vida je predstavila in vpeljala že več inovativnih storitev in tehnologij za dejavno in neodvisno življenje, s katerimi so lahko pregledali več ljudi in tako prej odkrili težave, s tem pa tudi zmanjšali stroške. Skupina za človeško kinetiko in mobilnost za starejše ljudi ima namen vpeljati inovativen ekosistem deležnikov in dobrih praks, da bi se spopadali s težavami na področju kinetike in mobilnosti. Skupina poudarja sodelovanje partnerjev na področju nevrologije, revmatologije, osteoporoz, človeške kinetike in drugih, kar naj bi vodilo k večji učinkovitosti oskrbe. Tretja dobra praksa pa je inovativni model za vpeljavo IKT v zdravstvo in vzpostavitev ekosistema in tehnologije za e-zdravje. Rezultati te prakse so partnerstva, ki se povezujejo glede na področja: preventiva in diagnoze, nega in zdravljenje ter aktivno in neodvisno staranje.
7. Ministrstvo za zdravstvo in socialne zadeve Andaluzija, Španija. Prva dobra praksa je »Andalusian strategy on active ageing« (ASAA), ki je osnovala »belo knjigo za aktivno staranje«. Glavni cilj strategije je, da se stari ljudje vključujejo v družbo, so del nje in da se jim ponudi različne priložnosti – organiziranih je veliko fizičnih, športnih aktivnosti za starejše, izdelali so »Junta card«, ki jim prinaša ugodne popuste pri športnih, kulturnih in sprostitvenih dejavnostih. Pomembne rezultat prakse je povezovanje in sodelovanje javnih in zasebnih deležnikov, ki skupaj oblikujejo oskrbo. Vpeljujejo tudi sistem »Andalusian e-Health strategy« (AeHS), ki s pomočjo elektronskega povezovanja zdravstvenih informacij povečuje kakovost življenja meščanov in izboljšuje koordinacijo zdravstvene in socialne oskrbe. Sistem je na voljo vsem prebivalcem, lekarnam, zdravstvenim organizacijam. Kot dobra rešitev se je izkazalo naročanje po telefonu in internetu, in elektronsko predpisovanje zdravil (poročajo o precejšnjem znižanju stroškov zaradi ukinitve tiskanih receptov), med pozitivnimi učinki pa so med drugim manj obiskov pri zdravniku zaradi elektronskega dostopa do podatkov, hitrejši rezultati iz laboratorijev.
8. Region de Madrid-Consejería de Sanidad-Hospital Universitario de Getafe, Španija. Prva dobra praksa je program celostne nege za starejše. Program ima dva dela: eden je namenjen ljudem, ki so v bolnišnici. Pred odhodom domov se povežejo s primarno ekipo oskrbovalcev. Drugi pa je za osebe, ki so doma. Ti zajemajo telefonske klice za preverjanje pacienta, spremljanje njegovega stanja z IKT-podporo, aplikacije za e-zdravje za ljudi s srčno okvaro. Rezultati kažejo, da je manj obiskov bolnišnice, da se čas okrevanja v bolnišnici skrajša, kar seveda pomeni nižje stroške za zdravstveni sistem. Druga dobra praksa pa je klinika za padce in zlome, program integrirane nege za starejše, ki so pod tovrstnim tveganjem. Program

vsebuje ocenjevanje tveganja za padce, oskrbovanje pacientov, ki so doživeli padec ali zlom, nudenje ustrezne rehabilitacije ter organizacijo specializiranih izobraževanj za zdravstvene delavce, ki delajo s temi ljudmi. Rezultati prakse: manj zlomov in padcev, manjše čakalne vrste za operacijo, zgodnejša odpustitev iz bolnišnice in oblikovanje osebnih načrtov za okrevanje, ki jih dobijo pacienti.

9. Južna Nizozemska. »Medical Delta« predstavlja dobro prakso »model za celostno oskrbo Walcheren«. Gre za model, ki zazna in oceni potrebe po negi za šibke starejše ljudi, ki živijo neodvisno. Model vključuje celotno verigo oskrbe, od zgodnjega odkrivanja do zdravljenja: preprečevanje, zdravljenje, nega, primarna, sekundarna in terciarna oskrba. Rezultati eksperimentalne skupine so pokazali visoko zadovoljstvo ljudi z oskrbo, zmanjšanje bremena neformalnim oskrbovalcem, formalni oskrbovalci so delali bolje in so bili s tem sistemom bolj zadovoljni.
10. Nijmegen: Health Vallex, Nizozemska. Prva dobra praksa je model mreženja za dejavno in zdravo staranje. Gre za sodelovanje med oskrbovalci in profesionalci na medmrežju (ParkinsonNet, Frail Elderly Network itd.). Druga praksa je program za inovativno življenje in oskrbo, pri katerem skupine oskrbovalcev podpirajo starejše in osebe s kroničnimi boleznimi, da živijo neodvisno življenje, prejmejo pa storitve oskrbe takrat, ko jo res potrebujejo, in ni nepotrebnih posredovanj. Tako je bilo manj nepotrebnih obiskov bolnišnic, manj nujnih posredovanj, zdravstvene zavarovalnice so opazile znižanje stroškov itd. »Asterhoekconnect« pa je sistem za starejše, ki jim pomaga, da čim dlje ostanejo doma: skušajo preprečiti osamljenost, ponujajo hiter dostop do potrebne oskrbe preko videokomunikacije z medicinsko sestro in ostalimi oskrbovalci, nameščeni so različni senzorji itd. Rezultat je boljše delo sester in oskrbovalcev, saj imajo boljši dostop do starejših, ko jih ti potrebujejo. Pokazalo pa se je tudi, da so starejši manj obremenjeni, boljše volje in manj osamljeni. Podaljša se tudi čas, ko lahko neodvisno živijo v svojem domu.
11. Provinca Noord-Brabant na Nizozemskem predstavlja eno najbolj uspešnih območij na področju soočanja s staranjem prebivalstva. Predstavljajo tri dobre prakse. »Care site« je spletna platforma, kjer se lahko prijavijo osebe, ki želijo organizirati neformalno oskrbo. Prijavijo se tako tisti, ki potrebujejo pomoč, kot tudi tisti, ki bi jo nudili. Tako lahko tisti, ki potrebuje pomoč, zelo hitro in enostavno pride do nje, poenostavljena je izmenjava informacij med formalnimi in neformalnimi oskrbovalci ter oskrbovanci itd. »Zorgcirkles« je iniciativa, ki skuša zagotavljati kakovostnejšo oskrbo in več varnosti ponoči in ob koncih tedna za ljudi, ki to potrebujejo. Rezultati so: hitrejša nujna pomoč, ko je ta potrebna, manjši ponudniki oskrbe postanejo finančno bolj stabilni, oskrba na domu je stroškovno veliko bolj učinkovita. »Smarter with care« je načrt, kako zmanjšati stroške zdravstvenega zavarovanja in obdržati dobro zdravstveno stanje prebivalstva. Rezultat so nižji stroški in bolj stabilen zdravstveni sistem.
12. Liverpool, Združeno kraljestvo. Program Mi (More Independent) skuša spremeniti razdrobljeno nego in nego majhnega obsega v celostno, integrirano storitev. Namen je zajeti 50.000 ljudi in jim pomagati živeti zdravo in neodvisno tako, da jih spremljajo s pomočjo podpornih tehnologij.
13. NHS24 Škotska, Združeno kraljestvo. Predstavljajo tri dobre prakse. Prva je Nacionalni program za razvoj oskrbe na daljavo, s katerim želijo omogočiti ljudem, da čim dlje živijo doma. Oskrbo na daljavo (angl. telecare) vpeljujejo kot sestavni del zdravstvenih in oskrbovalnih storitev. Po širši vpeljavi oskrbe na daljavo so poročali o občutnem zmanjšanju stroškov zaradi nepotrebnih hospitalizacij, nepotrebnih obiskov zdravnikov in na drugi strani pacienta na domu itd. Druga praksa je »SPARRA«, inovacija, ki omogoča boljšo uporabo lokalnih podatkov za to, da se oblikuje načrt za intervencijo v primeru padca. Ti urejeni podatki lahko povedo, katere osebe so pod večjim tveganjem, da padejo. Tudi pri tej praksi poročajo o manj nočitvah v bolnišnici zaradi pravočasne intervencije in v prvi vrsti zaradi preventive. Tretja dobra praksa pa je Nacionalni program za padce, ki ima namen zmanjšati osebne in ekonomske stroške padcev na Škotskem.

Po pregledu evropskih dobrih praks vidimo, da so te pomembno vplivale na bolj kakovostno staranje. Vse prakse, ki so jih testirali ali že vpeljali, so pokazale dobre rezultate; najpogosteje pa poročajo o naslednjih:

- zmanjševanje stroškov (zaradi zmanjšanj nepotrebnih obiskov pri zdravniku, nepotrebnih obiskih pacientov na domu, zaradi manj administrativnih postopkov itd.);
- zdravje in počutje starejših oseb se je izboljšalo;
- pacienti so manj časa preživeli v bolnišnici in so lahko varno okrevali v svojih domovih (zaradi spremljanja na daljavo);
- starejši in svojci dobro sprejeli tehnologijo, saj so bili zaradi nje manj v skrbeh in pomirjeni
- zdravstveni delavci so bili manj obremenjeni in so bolje opravljali svoje delo;
- odprle so se možnosti za inovativna podjetja, ustvarjena so bila nova delovna mesta.

Kot je razvidno, se vsi rezultati skladajo s »trojno zmago« (ang. tripple win). Glavni cilj, ki si ga je Evropsko partnerstvo za inovacije za aktivno in zdravi staranje zadalo doseči do leta 2020, je namreč izboljšanje zdravja in kakovosti življenja starejših, izboljšanje vzdržnosti in učinkovitosti sistemov oskrbe ter nove priložnosti za rast podjetij in njihove tržne priložnosti. Do podobnih ugotovitev so pripeljale tudi druge raziskave (Beale idr., 2010, Carretero 2015). Carretero (2015) na podlagi preučevanja različnih študij ugotavlja, da so nove tehnologije omogočile izboljšanje kakovosti življenja starejših in njihovih oskrbovalcev, zmanjševanje socialne izključenosti, izboljšano zdravje in varnost starejših. Z vpeljavo tovrstnih rešitev se zmanjšajo obiski in tudi čas okrevanja v bolnišnici, prav tako pa tudi število obiskov pri zdravniku. Pomemben pozitiven učinek pa so tudi širše koristi vpeljevanja inovativnih tehnologij, recimo stabilnosti socialnega in zdravstvenega sistema in bolj učinkovita poraba sredstev.

### 9.2.7. Zaključek

Kot že navaja nacionalna resolucija (glej Resolucija o nacionalnem programu socialnega varstva za obdobje 2013–2020) postavlja naraščanje starejše populacije tako socialni kot zdravstveni sistem pred izziv povečanih potreb po storitvah dolgotrajne oskrbe in drugih starejšim prilagojenih storitvah, ki tem omogočajo oziroma lajšajo vsakodnevno življenje in vključevanje v okolje. Tu ne gre le za vprašanje premajhnih kapacitet in ponudbe storitev, ampak tudi za pereče vprašanje financiranja (naraščanja stroškov). Storitve nadzora starejših na domu se kaže v IKT, pri čemer so potrebni senzorji in druga oprema, kar je potrebno financirati in vgraditi v bivalna okolja. In kot ugotavljata Stankovski in Štefanič (2016) se je še pred nekaj desetletji o različnih »pametnih skupnostih« – domovih, v katerih se luči samodejno ugašajo in prižigajo, okna zapirajo in odpirajo, ali pa je vse to mogoče upravljati celo z glasovnimi ukazi – lahko le brali, danes je vse to že realnost.

Ob naraščajočem deležu starejšega prebivalstva lahko prav inovativne rešitve, ki temeljijo na informacijsko-komunikacijskih tehnologijah omogočijo premostiti demografski izziv in pomagajo ustvarjati starosti prijazna (in pametna) bivalna okolja za starejše. Za zaključek ob tem navajamo spoznanja Cvetke Sušin (2015), ki se sprašuje, kako zagotoviti vse več starejšim kakovostno, aktivno in zdravo starost, pa postaja pomembno vprašanje, ki ga skušajo razrešiti tudi različne evropske iniciative in partnerstva. Kot možna rešitev vse večjih potreb po kakovostni oskrbi na domu se pogosto omenja uvajanje IKT rešitev, s katerimi bi naj se izognili prezgodnjemu institucionalnemu varstvu ter starejšim omogočili zdravo in aktivno staranje. Hkrati pa bi z vpeljavo tovrstnih rešitev lahko zagotovili bolj stabilen sistem oskrbe in zdravstva. Z namenom doseganja teh ciljev se je v Evropi vzpostavilo tudi Evropsko partnerstvo za inovacije za aktivno in zdravo staranje, v okviru katerega so se razvile mnoge dobre prakse, ki predstavljajo rezultat sodelovanja različnih deležnikov v posamezni državi, ki sodelujejo za skupen cilj, to je kakovostno bivanje in oskrbo starejših. Države in regije, ki so implementirale inovativne rešitve, poročajo o mnogih pozitivnih učinkih, ki so posledica tega: zmanjševanje stroškov zdravstvenega in oskrbovalnega sistema, boljše zdravje in splošno počutje starejših, bolj učinkovito zdravljenje, višja kakovost oskrbe itd. Eden najpomembnejših dosežkov pa je možnost, da ljudje svojo starost preživijo v domačem okolju in ne v institucionalnem varstvu, kot bi bilo potrebno, če ne bi bilo na voljo omenjenih rešitev. S pregledom evropskih dobrih praks se kaže, da imajo lahko inovativne rešitve, ki temeljijo na IKT zares pomembno vlogo pri reševanju aktualnih družbenih izzivov, kot je staranje prebivalstva. Iz evropskih primerov je jasno razvidno, da se je inovativnih rešitev potrebno lotiti sistematično in celostno. Niso dovolj le posamezne storitve ali pripomočki, ampak je potrebno zagotoviti celostno oskrbo. Le s celostnim pristopom bo mogoče ustvarjati starosti prijazna (in pametna) bivalna okolja.

### 9.2.8. Zahvala

Zahvaljujemo se Agenciji Republike Slovenije za raziskovalno dejavnost, ki je iz državnega proračuna financirala temeljna raziskovalna projekta Inovativne oblike bivanja za starejše ljudi v Sloveniji (številka J5–6824) in Model za staranje starejših v domačem bivalnem okolju v Sloveniji (številka J5–8243). Vodja obeh projektov je bil doc. dr. Boštjan Kerbler. Članek je nastal v okviru podiplomskega doktorskega študija Suzane Peer Kvas na Novi Univerzi (Evropska pravna fakulteta).

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## 10. Planning



## 10.1. Negotiations between developers and planning authorities in urban development projects – the case of Oslo, Norway

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### 10.1.1. Abstract

Since the first nationwide planning law of 1924, Norwegian statutory planning has provided market actors with extensive formal rights to initiate and prepare detailed zoning plans for development projects. From mid 1990s, densification of the urban fabric has been the stated Norwegian national policy for urban redevelopment. For the same period, local public authorities has relied on private property development as a means for urban development.

Most often, urban densification and transformation in Norway would include the approval of a new detailed zoning plan – initiated and prepared by a private developer. Usually this process includes negotiation between the municipal planning agency and the private developer on land use and building possibilities, prior to the final approval of the plan by the municipal council. However, it is claimed that the rather rigid and legally binding nature of Norwegian statutory planning leaves too little room for such negotiations.

Hence, a system of informal strategic land-use plans has been adapted as framework for negotiations, aiming at interest-based bargaining rather than positional bargaining. It is believed that such informal plans could guide the negotiations, establish trust between the parties and through this, the stable and predictable conditions necessary for interest-based bargaining.

This paper reports on findings from negotiations throughout the process of preparing detailed zoning plans in Oslo, Norway. Four planning processes, involving two major developers – for both developers one plan including an informal strategic land-use plan and one without – are investigated. Contrary to common beliefs the findings indicate that trust are not dependent on the existence of informal strategic land-use plans, but heavily rely on participatory behaviour, in particular the ability of the public planning agency to provide for stable personal relations.

Negotiations ending in positional bargaining happened when the public planning agency was unable to provide the same case manager throughout the process, and made frequent exchanges throughout the process of negotiation.

**Keywords:** Statutory planning, Indicative planning, Real estate development, Negotiations

### 10.1.2. Introduction

From mid 1990s, densification of the urban fabric has been the stated Norwegian national policy for urban development. Biodiversity, conservation of green structure and development of an efficient and environmentally sound transport system was the stated justifications for this shift in land use policy (St.meld. nr. 31 (1992-1993) p. 14). The policy change has resulted in a shift of focus from greenfield to brownfield urban development and from area zoning plans towards what has been named “postage stamp plans”, i.e. limited plans only covering the area of interest for the private developer. For the same period, local public authorities have relied on private property development as a means for planning and implementing urban development. This contrasts the post WWII situation, particularly in the decades of 1950s to 1970s, where municipalities played a pro-active role in the urban growth and urbanization of a rural population. As elsewhere, this largely happened through public land pooling through acquisition of unzoned greenfield areas on the urban fringe, which subsequently bit by bit was zoned and turned to urban development. Necessary infrastructure was funded through ordinary municipal revenue and semi-public bodies implemented the new suburban settlements.<sup>2</sup>

Most often, urban densification and transformation in Norway will include the approval of a new detailed zoning plan – initiated and prepared by a private developer. Usually this process includes negotiation between the municipal planning agency and the private developer on land-use and densities, prior to the final approval of the plan by the municipal council. However, it is claimed that the rather rigid and legally binding nature of Norwegian statutory planning leaves too little room for such negotiations. Hence, the municipality of Oslo, the capital of Norway, has adopted a system of informal strategic land-use plans, outside the statutory planning system, as framework for negotiations between the municipal planning authorities and private developers (de Vibe, 2015). The municipal planning authorities believe that such informal plans could guide the negotiations, establish trust between the parties and through this, the stable and predictable conditions necessary for interest-based bargaining. It turns out, however, that such good intentions of structural changes are not always sufficient. It seems to be particularly important that the actors in the system are able to follow up the intentions behind the structural changes. This is difficult when the planning authorities make rapid changes of the responsible planning officer throughout the planning process. Trust, which is a prerequisite for interest-based bargaining, is not easily built when one of the parties too often substitute central actors.

### 10.1.3. The Norwegian planning system

The Norwegian land-use planning system is path-dependent. In order to understand the current system, it is therefore important to look into how private plan initiatives have been understood, and correspondingly how different planning levels are emphasized in the system. Public authorities might take a passive or active role in the planning and implementation of urban transformation (van der Krabben, Jacobs, 2013:775) and planning systems can be characterized as either plan-led or development-led (Muñoz-Gielen, Tasan-Kok, 2010:1099). The pro-active attitude is usually associated with plan-led systems. The Norwegian planning system should, in theory and based on the legally binding nature of both the land-use element of the municipal master plan and local zoning plans, be regarded as plan-led. This certainly was the aim when implementing the new Planning and Building Act in 2008. The planning system was developed with the aim of strengthening the municipal master plan and the land-use element of the master plan’s function as a

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<sup>2</sup> A major part of the growth took place through semi-public housing cooperatives and building societies, responsible for both the provision of new homes and commercial infrastructure in the new suburbs on land, which they acquired cheaply on subsidized terms from the municipalities.

comprehensive and coordinating instrument for private property development (Ot.prp. nr. 32 (2007- 2008) p. 28). For more than 50 years, Norwegian legislative authorities have regarded municipal master planning as the important hierarchical level.

However, the right for external players to initiate and prepare detailed planning has a long and unbroken record in Norwegian planning legislation (Kalbro, Røsnes, 2013:55). In practice, this right to initiate planning extends the developers’ position from an implementer to an initiator of development planning and responsible plan-maker

(Kalbro, Røsnes, 2013:51). Consequently, for the same period as densification has been the preferred public urban land-use policy (the mid-1990s), most detailed zoning plans have been initiated and prepared by external players (Røsnes, 2005:41). In the same period, the public housing policy<sup>3</sup> has turned from provision of housing as such (quantitative goals) towards distributive goals (Barlindhaug et al, 2014:38). The risks of facilitating for housing through active land banking and real estate development has caused Norwegian municipalities to withdraw, leaving active implementation to the private market. Hence, practically speaking, the Norwegian planning system should be described as passive-secluded and development-led. Today urban transformation in Norway hardly take place unless real estate developers consider brownfield areas as profitable. Seen this way, it is not an antagonistic relationship between Norwegian public planning and real estate development, but rather an acceptance of a symbiotic and necessary cooperation. Private real estate development is the major means for the implementation of zoning decisions and private developers initiate the lion's share of local zoning plans.

The current Norwegian planning legislation is based on three areas of action: comprehensive planning, land-use planning and plan implementation (NOU 2003:14 s. 36). The individual parts of this tripartite domain have been emphasized in varying degrees over the past 50 years, both in legislation and in practical planning. The first planning legislation covering the entire country, passed in 1965,<sup>4</sup> emphasized land-use planning understood as zoning on the municipal level, often referred to as the *General plan*. The aim of this planning was overall management of urbanization, understood as *urbs* (the physical city), in particular to control and locate the expansion of the built environment into the green fields. Such land-use planning can be described as prescriptive and regulative activity, even though the reasons for this activity could be found in distributive, redistributive and regulative considerations (Lowi, 1964:689–690).<sup>5</sup> The basic justification for this type of public intervention in property rights can be regarded as Pigovian welfare economics, as described by Lai (1994). Unlike all later generations of higher-level municipal land-use planning this first generation was not legally binding. Only local zoning plans was legally binding.

The next generation of Norwegian planning legislation was passed in 1985. The legislation introduced quite ambitious comprehensive planning and the *Municipal Master plan* as the new overall planning instrument, aiming to determine long-term challenges, goals and strategies for both the municipal community as a geographical unity (the city understood as both *urbs* and *civitas*) and the municipality as an organization. The former General plan was retained as an element in the Master plan (still understood as zoning), now referred to as the *Land-use Element of the Municipal Master plan*. The main parts of the bill was designed in the 1970s, a period of strong economic growth and continued belief in social democratic governance systems. Although it was not adopted until the mid-1980s, during a period when Norway was in the midst of a neoliberal process of

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<sup>3</sup> Provision of public housing policy has partly happened through the State Housing Bank and partly through municipal land-use planning and housing development.

<sup>4</sup> Prior to this, the planning legislation only applied for already built up areas in cities.

<sup>5</sup> Dalton et al. (1989) uses this division of policy types in a discussion on the limits of regulation.

change, the belief survived that planning authorities should have a leading role in urban development. The planning system was built on the assumption that public planning authorities should have the leading role in initiating and preparation of plans at any levels of planning.

Moreover, and consequently, the responsibility for financing the implementation of plans was seen as a municipal task. The regulative tools for implementation plans were formulated for that reason (Røsnes, 2002).

Quite soon after the implementation of the 1985 planning legislation, the neoliberal turn together with densification as governing national land-use policy challenged this assumption. In practice, attention was directed towards plan implementation and privately initiated local zoning plans. In many municipalities, this development challenged the considerations of the Municipal Master plan, as Norwegian planning legislation is

based on the principle that the last approved plan applies. Many local zoning plans were adopted with completely different land-use objectives than the previously approved the Municipal Master plans.

In the current planning legislation, municipal *Master plans* still shall “establish goals for the physical, environmental, economic, social and cultural development of municipalities”.<sup>6</sup> The plan still contains the legally binding *Land-use Element of the Municipal Master plan* and introduces two types of local zoning plans: the *Area Zoning plan* and the *Detailed Zoning plan*. However, and unlike the 1985-act, the current statutory planning system acknowledge the role of private developers in the implementation of plans. For this reason, measures for securing compliance between hierarchical levels of the statutory system are implemented. While developing Area Zoning plans primarily is a municipal task, the Detailed Zoning plan should be understood as a plan for implementation of development projects (NOU 2013: 14, p. 326), i.e. the plan to be used by private developers as a part of the process of granting a permit for developing the building plot. Contrary to previous Norwegian planning legislation which did not explicitly indicated ambitions for compliance between the hierarchical levels of the legally binding land-use planning system, the current Planning and Building Act has been designed with quite comprehensive ambitions for such compliance (Kalbro, Røsnes, 2013:60). According to Section 12-3, third paragraph, private proposals for local zoning plans must contextually comply with the main features and limitations in the land-use element of the municipal master plan and existing area zoning plans. If the detailed plan implies deviations beyond minor necessary clarifications, the higher-level land-use plans must be changed before or at the same time as the decision of the detailed zoning plan. This will normally also require environmental impact assessments.<sup>7</sup> Hence, it is appropriate to describe the current Norwegian planning legislation as an acceptance of the fact that local zoning, and through this the day-to-day management of urban development, happens as a part of private real estate development.

When private developers initiate a private local zoning plan, they are required to submit the planning question to the planning authorities in a meeting. This meeting is the start of what national planning authorities (Ministry of Local Government and Modernisation 2017) consistently terminate as a dialogue between builders and authorities about the further planning work. In practice, this dialogue is a process of negotiations. For this reason, it could be analyzed through negotiation theory. When the local planning later on authority receives a proposal for a local zoning plan from the private developer, it shall decide whether the proposal can be submitted to public scrutiny by the general public and affected public sectors. The planning authority has the right simultaneously to promote alternative proposals for regulation of the area. After the public scrutiny is completed, the

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<sup>6</sup> The Planning and Building Act, Section 3-1, a).

<sup>7</sup> Norwegian regulations in accordance with Directive 2014/52/EU and Directive 2001/42/EC.

planning process and negotiations between developer and planning authority normally continue, aiming to incorporate necessary changes. When the proposal for a regulation plan is finalized, it is submitted to the municipal council for decision, optionally still in alternatives.

In summary, it is appropriate to describe the Norwegian planning system as a deliberate attempt on rigid, imperative zoning. This is indeed a system that accept privately initiated plans and private property development as an important instrument for plan implementation, yet a system with intentions to curb private initiatives to conform to the Municipal Master plan. As such, the discretionary room for negotiations are relatively prominent. This is in line with the findings of Muñoz Gielen and Tasan-Kok (2010:1100) on many Western European countries, which theoretically have plan-led planning systems but show characteristics more similar to development-led planning. Buitelaar and Sorel (2010:983), commenting on the current Dutch planning system, describes planning systems in general as a trade-off between flexibility and legal certainty. As they conclude on planning practice in the Netherlands, even Norwegian planning practice seems to be more flexible than the general assumptions of the Norwegian planning system.

#### 10.1.4. The Oslo model

Although the Norwegian planning system is more flexible than what seems to be generally understood, planning authorities and politicians in Oslo Municipality find that the system of legally binding land-use plans on two hierarchical levels is not flexible enough. According to de Vibe (2015:32)<sup>8</sup> this is mainly because large scale overall statutory planning processes are too slow and therefore not suitable for controlling a reality where the planning authorities at any time processes more than 100 detailed zoning plans. Private real estate developers initiate the lion's share of detailed zoning plans. Such a large number of simultaneous planning processes indicate that urban transformation is taking place throughout the city. This requires flexible, coordinated plans at an overall level. Then there is not enough time to wait 5-10 years on an updated land-use element of the Municipal Master Plan or Area Zoning plan. The difficulties of statutory comprehensive planning<sup>9</sup> hindering its capacity to serve as an instrument of strategic planning is recognized in other Nordic countries as well (Mäntysalo et al., 2015:361).

To be able to deal with this situation, the "Oslo model" is developed. Unlike ordinary Norwegian statutory planning, this model rests on strategic and indicative planning, named "Guiding Principle Plan for Public Spaces" (In Norwegian «Veiledende Prinsippplan for Offentlige Rom», abbreviated VPOR). Such plans are not statutory, i.e. they cannot be found in the Planning and Building Act.

However, they are adopted by the City Council, as all statutory plans have to according to the Planning and Building Act. The purpose of VPOR is to improve the municipality's negotiation base with regard to developers (de Vibe, 2015:35). In VPOR, the main issues relates to the management of public infrastructure, including the location of the main street network with squares and parks. In addition, VPOR sets out principles for the design of the overall green structure, the approximate location and need for schools, kindergartens and other social infrastructure. A third area governed by VPOR is density and categories of land use, more overall stated than usual in statutory terms (see figure 1 for an example of VPOR). The Oslo model does not completely disregard statutory land-use planning. The more long-term development features for Oslo are determined in the Oslo model through the Municipal Master plan, which for a relatively long time has been of a highly generic character, limited to identifying areas of growth and focus areas in the city. The Land-Use Element of

<sup>8</sup> Ellen de Vibe is the Chief Town Planner of Oslo and head of the Agency for Planning and Building Services in the City of Oslo.

<sup>9</sup> Described by Mäntysalo et al. (2015:361) as "overblown survey and assessment demands, as well as time consuming participation procedures and public checks".



Figure 1. Maps / plans form the VPOR for Vollebekk, Oslo. Left map shows main street network with squares and parks, middle map shows designated land-use (yellow: residential, red: school / kindergarden, blue: business), right map shows accepted densities. The VPOR also consists of written descriptions which further elaborate on the criteria for development of local zoning plans.

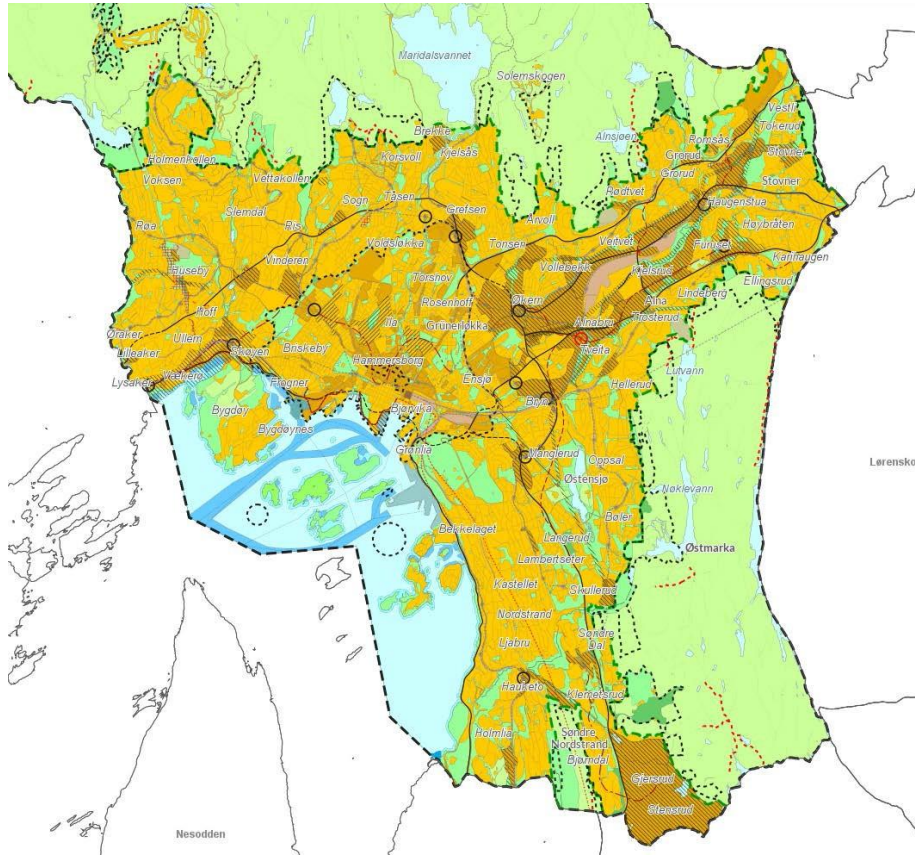


Figure 2. The Land-Use Element of the Municipal Master plan for the City of Oslo. The legally binding plan generically shows already built up areas (light yellow), areas for further development (dark yellow), urban green structure (dark green), green belt areas (light green) and areas designated for joint planning (hatched).

the Master Plan identify designated hubs on the public transport network for further densification, larger areas of transformation relatively centrally in the city and designated areas for joint further planning by landowners / developers (see figure 2). Additionally, the legislation on environmental impact assessments is used to require private developers to carry out such investigations of their projects.

#### 10.1.5. Negotiations

The starting point for negotiations is opposing interests, but not conflict. Rather, the parties depend on each other and share common interests. Negotiations take place because there is reason to believe that a negotiated deal is a better solution than otherwise (Rognes, 2015:23). Trust is integral to negotiations because of each party's interdependence with the other in achieving a resolution (Lewicki, Polin, 2013:166). Further, there is a relationship between trust and risk. Having something invested in the situation is a requisite to trust (Mayer et al., 1995:711). In negotiation theory, a distinction is often made between *distributive* and *integrative* negotiation (McCarty, Hay, 2015:4). Distributive negotiations is a game of win and lose, usually in negotiations about a fixed amount of value. What one actor are able earn through the process, the other lose. Integrative negotiations, on the other hand, is about win-win resolutions. As stated by Fisher et al. (1991:11) you should not bargain over position but focus on interests. Positions tend to obscure what you really want to achieve. By focusing on interests, there is a possibility for broadening the basis for solutions and thereby change the prerequisites so that both parties achieve solutions they think are better for themselves. For this reason, integrative negotiations

tend to be more complex and demanding than distributive (Rognes, 2015:61), and, above all, rely on trust between the parties involved (Butler, 1999:218). Trust seems to inhibit distributive behaviour and facilitate integrative behaviour, leading to the sharing of information, which subsequently promote the joint outcome of negotiations (Kong et al., 2014:1248). However, integrative behaviours are inherently risky (Kong et al. 2014:1238) as long as the other party might exploit it. Hence, if you do not trust the other party in a negotiation, the risk associated with information sharing tend to lead to your own withdrawal back to distributive bargaining.

The initial problem of legally binding zoning plans is that they tend to focus on positions. Land-use objectives, maximum densities and building heights, building lines, etc. are fixed positions. The interests behind were to be discussed (negotiated) in the plan-making process before the planning decision. As described above, Norwegian statutory planning consists of legally binding zoning at two hierarchical levels where detailed zoning plans shall comply with the overall municipal master plan. Consequently, the statutory system describes a situation where, to gain influence, real estate developers ought to take part in the ordinary participatory processes, which most likely took place several years prior to the land acquisition. This is an unlikely situation. The private property developer will most likely first get involved when initiating and developing the detailed zoning plan, which must comply with regulations in the higher-level zoning plan. This easily leads to positional bargaining and distributive negotiations between developer and planning authorities about the more detailed elaboration of the higher-level plan. To some extent, this problem might be solved by changing the higher-level plans towards a more generic character. However, the legally binding nature of the zoning reduces or removes at some point the opportunity to negotiate interests instead of positions. It is for this reason that the City of Oslo has developed its model for informal strategic land-use planning. Indicative land-use plans, it is believed, focuses on interests, not on fixed positions. Hence, such planning processes should make more space for integrative negotiations.

Several stages of trust in negotiations can be identified (Lewicki, Polin, 2013:162-164). First, there is *deterrence-based trust*, relying on the belief that the other party will follow agreed promises due to

negative consequences for not complying with them. The next stage is *calculus-based trust*, which is to trust the other party because you yourself want to achieve positive consequences. A further stage is *knowledge-based trust*, understood as trust residing in the ability to know and understand the other party accurately enough to predict what it wants and how it will behave. Finally, there is *identification-based trust*, characterized by an identification with the other and an effort to help the other realize their goals. According to Lewicki and Polin, this latter type of trust “is often seen in integrative negotiations, and particularly between parties who know each other very well, where the parties not only have individual goals to achieve but also define and work to accomplish joint goals” (p. 164). Anyhow, trust is not the same as trustworthiness. Your propensity to trust depends on judgements of three attributes of the other party: characteristics of their ability, benevolence and integrity to be trusted (Mayer et al., 1995). For this reason, negotiations are not only dependent upon the existence of necessary structural conditions, as have been developed in the “Oslo model”. Additionally, the parties who negotiate must possess the properties necessary to make them good negotiators. This means that they must have made considerations of the trustworthiness of the other party and themselves accept the risk involved in the trust game.

Besides the necessary establishing of trust, there are three prerequisites for succeeding with integrative negotiations. First, the negotiation problem must have more than one dimension. Secondly, the parties must be motivated to invest time in such complex negotiations. Lastly, one must have the competence to conduct such negotiations (Rognes, 2015:62). While distributive negotiations is of a competitive nature, integrative negotiations is not. They require cooperation (McCarty, Hay, 2015:14). An important component of such cooperation is the process of inventing options for mutual gain (Fisher et al., 1991:58). Informal strategic planning is a vital precondition for creating common ground. As an example, developers could prefer risk reduction, trading this against higher quality of public infrastructure. On the other hand, public authorities could accept alternative concepts for the building pattern or densities, if developers are willing to incorporate new public facilities into the development.

However, even if problems are multidimensional, the parties do invest enough time and are competent negotiators, not all negotiations end with an agreement. The reason you negotiate is to produce something more

valuable than if not negotiating. Hence, you should know what a better solution than the negotiated one is. This sometimes is referred to as BATNA (Best Alternative To Negotiated Agreement (Fisher et al., 1991:104). For private developers the ultimate test would be the bottom line of the project budget, although red numbers in a single project for some developers might be acknowledgeable if this leads to later gains. For planning authorities the BATNA more often would be a postponement of the urban transformation in anticipation of changing market conditions make the developer to accept the qualitative solutions.

#### **10.1.6. Four cases and two developers in Oslo<sup>10</sup>**

In order to explore if and possibly how the "Oslo model" is able to establish a basis for integrative negotiations, four processes of granting planning decisions for real estate development projects in Oslo have been analysed – two projects where VPOR has been used as the informal planning framework<sup>11</sup> and two projects planned according to the ordinary statutory planning system. See figure 3 for location of projects and figure 4 – 7 for details about each projects. In order to reduce the risk that different attitudes towards negotiations among various property developers and

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<sup>10</sup> The empirical data presented in this paper derive from a master thesis by Kind and Vedrana (2017) for which the author of this paper supervised.

<sup>11</sup> *Veiledende prinsipplan for det offentlige rom (VPOR) for Ensjø.*

responsible departments of the planning authorities would affect the analyses, it was decided to refine the analysis to two different but experienced developers operating in two neighbourhoods of Oslo. The planning processes were completed in the period 2011-2017, conducted by the real estate developers OBOS and Neptune Properties, with one plan with one and one without VPOR respectively.

Although not a part of the chosen criteria for selecting cases for this empirical study, all four projects are located in designated transformation areas in Oslo's Municipal Master plan. There will always be some ongoing private initiated planning processes throughout the construction zone (infill projects). However, the bulk of construction in Oslo for the last couple of decades has been located in designated development areas.



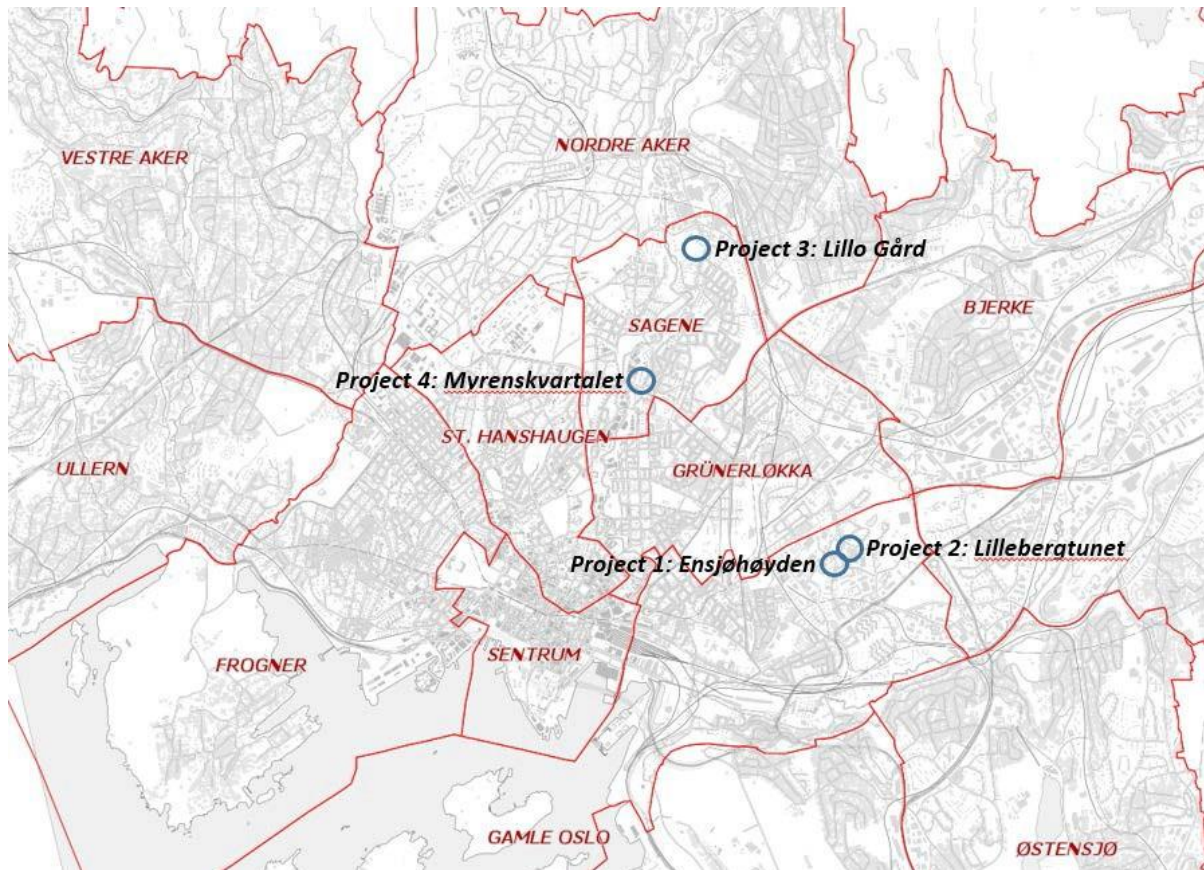


Figure 3. Location of the four cases in Oslo, Norway (map: <https://od2.pbe.oslo.kommune.no/kart>).

Figure 4

Project 1: Ensjørøyden  
Developer: Neptune Properties  
With VPOR

Former zoning: Industrial  
New zoning: Housing (133 dwellings)

Kick-off for detailed zoning plan: 15.11.2013  
Public scrutiny starting: 15.09.2015  
Planning decision by City Council: 14.12.2016

Kick-off to public scrutiny: 304 days  
Public scrutiny to planning decision: 821 days  
Kick-off to planning decision: 1125 days

Written comments during public scrutiny: 16  
Responsible public planning officers: 4  
Number of zoning proposals for adoption: 1



<http://www.ensjohoyden.no/galleri/>

Figure 5

Project 2: Lillebergtunet  
Developer: OBOS  
With VPOR

Former zoning: Industrial  
New zoning: Housing (92 dwellings)

Kick-off for detailed zoning plan: 15.01.2014  
Public scrutiny starting: 12.01.2015  
Planning decision by City Council: 07.09.2016

Kick-off to public scrutiny: 362 days  
Public scrutiny to planning decision: 604 days  
Kick-off to planning decision: 966 days

Written comments during public scrutiny: 9  
Responsible public planning officers: 1  
Number of zoning proposals for adoption: 2



<https://www.obos.no/privat/ny-bolig/boligprosjekter/oslo/lillebergtunet>



Figure 6  
Project 3: Lillo Gård  
Developer: OBOS  
Without VPOR

Former zoning: Industrial / offices  
New zoning: Housing (415 dwellings) / daycare  
Kick-off for detailed zoning plan: 16.06.2014  
Public scrutiny starting: 08.06.2015  
Planning decision by City Council: 11.05.2016  
Kick-off to public scrutiny: 357 days  
Public scrutiny to planning decision: 338 days  
Kick-off to planning decision: 695 days  
Written comments during public scrutiny: 21  
Responsible public planning officers: 2(1)  
Number of zoning proposals for adoption: 1



<https://lillogard.no/>

Figure 7  
Project 4: Myrenskvartalet  
Developer: Neptune Properties  
Without VPOR

Former zoning: Industrial  
New zoning: Housing (118 dwellings) / daycare  
Kick-off for detailed zoning plan: 15.12.2011  
Public scrutiny starting: 10.12.2014  
Planning decision by City Council: 21.06.2017  
Kick-off to public scrutiny: 1087 days  
Public scrutiny to planning decision: 924 days  
Kick-off to planning decision: 2011 days  
Written comments during public scrutiny: 13  
Responsible public planning officers: 5  
Number of zoning proposals for adoption: 2



<http://www.myrenskvartalet.no/galleri/>

### 10.1.7. Discussion

The four planning processes can be analysed based on different parameters. In particular, three factors seem to differentiate between the projects: type of negotiation, number of plans submitted for approval by the City Council and number of responsible planning officers involved in the negotiations. Perhaps somewhat surprising, there is little evidence that the use of informal plans through VPOR instead of the ordinary statutory planning system has had a significant impact on the outcome of the planning processes.

All four detailed development plans are located within designated transformation areas, zoned in the Municipal Master plan for the City of Oslo<sup>12</sup>. Except being designated as transformation areas, there are few guidelines in the overall plan for the specific land use that may be permitted. An underlying premise is, however, that Oslo's estimated need for new housing is to be covered. The main new zoning objective for all four projects is housing. For the two areas subject to VPOR, some more detailed guidelines, however informal, have been provided in generic terms for main road structure, green structure and land-use goals with the specified density. In the two areas that have followed the ordinary statutory planning system, green structure, and to some extent the overall road network and land-use objectives have been determined through previously prepared statutory plan.

Due to the generic nature of the overall plans, both in the ordinary statutory planning and in the informal VPOR, all four projects contain multidimensional issues that are largely suitable for integrative negotiations. There seem to be small factual differences between the statutory and informal plans regarding ability to control urban transformation. Nor do there appear to be any significant differences in how the parties have invested time and resources in the planning processes. In all four projects, a number of meetings have been held between developers and planning authorities. A number of proposals for plans and more detailed elaborations for how to solve specific problems that has been raised, have been prepared and adjusted during the process towards the final plans to be put forward for the City Council for decision.

The question whether the parties having the necessary competence to conduct integrative negotiations is somewhat more difficult to answer. Both of the two property developers in the study have long experience of such negotiations, in both Oslo and elsewhere. In addition, usually there are huge financial burdens associated with real estate development, which is an additional factor for developers to develop necessary skills for integrative negotiation. Consequently, one might conclude that the developers involved in this study should have sufficient negotiating competence. However, for two projects – Project 2: Lillebergstunet (with VPOR, developer: OBOS) and Project 4: Myrenskvartalet (without VPOR, developer: Neptune Properties) – the developers' preparation for the negotiating processes seems to have reduced the capacities for integrative negotiations. For project 2, the developer came to the kick-off meeting with a fully developed project, including a complete proposal for the detailed zoning plan and drawings of the apartments. For project 4, some actual information provided by the developer turned out to be incorrect, which meant that the planning authority had to double check a large amount of information.

With the large number of private proposals for detailed zoning plans that at any time are discussed with the planning authorities, the necessary competence should also be found there. However, two issues may challenge the planning authorities' ability to provide necessary negotiation skills in

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<sup>12</sup> Areas shown as "designated transformation areas" in the Land Use Element of the Municipal Master Plan of 2009. This plan precedes the plan adapted in 2015, shown in Figure 1 above, and contains corresponding development areas.

planning processes initiated by private developers. Firstly, the large quantity of plans discussed at any time can put pressure on available capacity. Secondly, large turnover among planners at the planning authority does occasionally result in frequent replacements of responsible planning officer for some of the privately initiated plans. Both of these conditions may cause the planning authorities to change focus from interests and back to

positions. New and inexperienced planning officers with limited time and capacity to acquire adequate insight into the concrete issues of complex planning processes are likely to concentrate on more technical and quantifiable topics. In some cases, this could result in intentions of integrative negotiations diminishing into distributive, without this being a conscious strategy.

Consequently, it appears that the parties' ability to establish mutual trust, rather than structural conditions, has been the central prerequisite for the ability to establish integral negotiations in the four planning processes. In particular two factors seem to have been decisive for whether developers and planning authorities have succeeded in commencing and continuing negotiations. Firstly, if they have clearly managed to distinguish between positions and interests. Secondly, if and how they perceive the other party as trustworthy. Two of the projects – Project 1: Ensjøhøyden and Project 2: Lillebergtunet – clearly started out as distributive negotiations. In Project 1, the planning authorities seems to have had problems trusting the developer's integrity as negotiator.

Put another way, they did not want to take the risk of trusting the other party and then experiencing to be exploited. Hence, they withdrew to distributive bargaining. Quite initially in the process, they clarified that they was prepared to promote an alternative zoning plan for public scrutiny and, if necessary, for adoption by the City Council if the developer did not make the necessary changes to his plan proposal. Along the way, several replacements of senior planning officer withheld the low trust between the parties, partly not even able to establish *deterrence-based trust*. However, the tense relationship changed after still another replacement. A planning officer who the developers in earlier processes had experienced a good dialogue with restored trust. Distributive negotiations turned into integrative and at least *knowledge-based trust* were established. The process ended with the submission of one unified detailed zoning plan for approval. In Project 2, the developer came to the kick-off meeting with a fully developed project. Hence, it became difficult for the developer to distinguish between positions and interests and accept adjustments to the plan. The planning authorities experienced that they had reached a situation where there was a better alternative than continued negotiations. Their BATNA was to promote their own alternative zoning plan for adoption by the City Council.

Project 4 Myrenskvartalet clearly identifies the importance of trust. Due to the lack of accuracy in the information provided by the developer, the planning authority seems to have questioned the developer's ability to be a trustworthy party. This initial lack of trust developed throughout the negotiations into a situation questioning also the benevolence and integrity of the developer. On the other hand, the developer seems to have questioned whether several replacements of responsible planning officer made the planning authority able to see the complexity of the project, also questioning their benevolence towards searching for joint solutions. Overall, this project is characterized by a substantially high degree of perceived conflict level.

The only project that clearly can be described as truly integrative negotiation is Project 3: Lillo gård. Informants describe the process as "give-and-take". Even if the developers also in this project came to the kick-off meeting with a thoroughly developed project, it seems that both parties propensity to trust the other developed into a climate of *identification-based trust*. In this case, two responsible planning officers were involved. However, the second planning officer was appointed early in the

process. Practically, one planning officer handled the negotiations throughout most of the zoning process. It seems that both parties valued the ability, benevolence and integrity of the other.

### 10.1.8. Conclusions

The planning authority in Oslo has developed its own model – the "Oslo model" – with VPOR as a key instrument for informal strategic land-use planning. They believe that this model is better suited to manage negotiations with real estate developers than traditional statutory planning. This paper contains a study of four planning processes initiated by two experienced property developers, two where VPOR is used and two based on traditional statutory planning. The findings from this study indicates that the statutory and legally binding planning system could work just as well as VPOR as the basis for integrative negotiations. There is reason to assume that this is largely a consequence of the use of more principal and generic legally binding land-use plans in the Municipal Master plan of Oslo. This is a key point, allowing the planning system to be flexible enough to negotiate interests instead of positions.

On the other hand, it seems that the parties' ability to trust each other is even more fundamental for both the opportunity to establish integrative negotiations and for the outcome of the negotiations. Predominantly two conditions seem to be important. First, the initial propensity of the parties to trust the other affects both parties' assessments of the others' ability and benevolence to negotiate. In two of the cases in this study it appears that the responsible negotiators at the real estate developer had inadequate trust in the planning authority's ability and benevolence to negotiate already the preparation phase, which means that they have gone a long way in developing completed plans before the kick-off meeting. The lack of trust led them initially to lock in positional negotiations. In two of the cases, the responsible planning officer at the planning authority showed similar initial inadequate trust in the other party. Such propensity not to trust the other party necessarily leads to positional bargaining and consequently to less reluctance for using your BATNA. Second, the ability to maintain and build trust throughout the process seems to have significant influence for the immediate output and even longer-term outcome of negotiations. Frequent changes in responsible negotiators affects the climate of negotiations, substantially reducing the capacity for integrative negotiations. The immediate output is a reduction of trust, understood as ability to conduct integrative negotiations. The outcome of such negotiations is more likely "win-lose" rather than the wanted "win-win" situations. Frequent changes of responsible negotiator particularly is a problem found at the planning authority due to large turnover. In two cases, frequent replacements of planning officer contributed to the developers asking questions about the planning authority's capacity to invest sufficient time and resources and, hence, the ability to negotiate.

A primal concern of both Norwegian statutory land-use planning and the informal strategic land-use planning of the "Oslo model" has been the system's capacity to be pro-active and plan-led. Both systems can be characterized as deliberate attempt on introducing pro-active and plan-led governance of the relationship between real estate developers and planning authorities, avoiding the commonly understood antagonistic attitudes toward each other. The changes implemented in the current planning law, with greater demands for hierarchical conformity, seem to some extent to work. At least together with the principal and generic character of the Land-Use Element of the Municipal Master Plan in Oslo. Requirements for conformity and generic overall planning seems to have strengthened the plan-led dimension. At the same time does generic overall plans give developers more room to manoeuvre according to own goals in the development of the detailed zoning plans. Combined with the fact that mainly real estate developers initiate detailed plans, and only when and where they need it, developmental planning still becomes dominant. In such a still

actually development-based planning system, the parties' ability, benevolence and integrity as negotiators will be decisive for the outcome, both seen by the planning authorities and the developers. There is reason to believe that such trust must develop over time. Hence, the frequent changes of responsible planning officers and large turnover with the planning authorities poses a challenge for the opportunities to achieve the wanted integrative negotiations with “win-win” solutions.

### 10.1.9. References

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## **10.2. Multimap as a Method for Strategic Planning – Tool and Practical Results and Experience as Base for Use in Urban Areas**

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### **10.2.1. Abstract**

The objective of the paper is to present results using multiMap method, which is a tool for mapping performance of building portfolios, can be developed as an input to strategic planning in urban areas. Project initiated by Nordic Ministers, the methodology was used for a common Nordic project on Sustainable Refurbishment (SURE), finished in 2015, to obtain and upkeep “Well-being” for users and owners of buildings.

Living environment is the totality in our daily life described as the social and physical framework. During our life’s social needs are changing. It is about safety, security, activity, rest etc. Good indoor environment is not enough in itself, but outdoor in streets, parks, shops, cafes, schools, places for work, medical treatment and activities are all a part of the total environment. Increasing urbanization also creates a demand for Urban FM (Facility Management).

The methodology used in the model are both qualitative and quantitative research methods. A substantial part of getting information to the model is based on structural collection of data and knowledge already present in the actual organization. This gives quick and cost efficient access to information at required level of accuracy.

This paper presents findings in real life projects, improvements and practical use of results so far and possible new areas to for development, and how strategic level of FM can collect, organize, visualize and communicate data as means for upkeeping Well-Being in urban areas.

**Keywords:** Building portfolios, Urban development, Facilities Management, MultiMap, Strategic analysis, KPI

### 10.2.2. Introduction

The background for the project is the recognition that there is a clear connection between the design of the built environment, the quality of life of individuals, the social structure of society and business development. Planner-, construction and property industry plays a crucial role in enabling good cities and towns (Norwegian White Paper Stm. 28, "Good Building for a Good Society", 2012). Comprehensive research, however, shows that development of urban areas must be linked more closely to an understanding of the development of economic sustainability as a consequence of social improvements. Lack of understanding of this connection leads to cities and towns who, to a far lesser extent, got less desirable ability to create value for the citizens, business and society as a whole.

In most urban areas throughout the world there is three major trends going on; 1) transformation of industry areas to integrated multipurpose areas, 2) growing population and increasing living age and 3) needs for decreasing use of nonrenewable energy based transportation. Results of earlier research (Rus, 1997, Temeljotov 2004) show that the characteristics of physical microenvironment, especially the residential and working environment can significantly influence the quality of our life. It is also well known and documented that backlog of maintenance has a significant influence on the environment, both indoor as well as outdoor, which will affect the users of the buildings regarding health, safety, social and environment experience.

The Norwegian Labour Inspection Authority has over a period of three years inspected schools and some hospitals and a number of public building owners have received notice to upgrade the buildings so the health and safety requirements at work act can be fulfilled.

Mapping the area from the perspective of an existing state of art in urban area, potential for future development and evaluating the gaps from social, economic, and environmental sides, are important for the analysis of every area. Combination of data mapping and value contribution should turn out to be effective tools for gathering and analysing large amounts of information. The way of classifying information gives opportunity to aggregate data to create comprehensive key performance indicators (KPIs), and with new technology to visualize results to obtain effective way of communicating complex information. Comparison assessed data (performance) and demands will give answer on upgrading needs.

The method should include technical, social, adaptability and usability conditions. The main data should cover: energy consumption of existing buildings in the area; social needs of the citizens and communities; attractors and stickiness of the urban place; investors' potentials and orientations; other possible interest in the area development; and ownership and demographic data. To implement improvements it is necessary to put forward demands in social, economic and environmental aspects.

The Facility Management (FM) function in a building or campus (schools, hospitals, universities) has developed from being janitor or caretaker to be a coordinator of all needs for supporting core business. According to EN 15221 – 4 "Taxonomy" FM is divided into "Space & Infrastructure and People & Organization" and is a strategic role to search, facilitate and demonstrate need of a business organization as a proactive action that helps the business organization to understand their future needs (Valen et al. 2014). Documentation of needs for maintenance and upgrading is important in promoting and communicating the buildings needs, and aggregating these needs in an objective and comparable measure across the portfolio is a real challenge for the Facility Management (FM) organisation. It is important to use models that cover all aspects which have impact on the core business effectiveness. Urban areas has the same needs, but the big difference from campus mentioned above, is the fact that urban areas has a lot of different core business and stakeholders. To get all stakeholders satisfied FM should provide deliveries such as flexible solutions, well maintained and adaptable buildings and space between them as well as being service

oriented towards the customers satisfaction and needs. Urban FM has to comprise the combination of socio-technical skills (Temeljotov et al 2018).

### 10.2.3. Methodology / approach

The methodology is described in terms of building portfolios, but is equally adaptable to spaces, urban areas and other objects as described in the previous chapter.

In 1997 Oslo City Council asked for an estimate of upgrading costs and value of their total building portfolio of approximately 4 million m<sup>2</sup>. Due to short time for the assessment of technical condition and the size of the portfolio, the multiMap method was developed.

In addition to the technical condition, there has been an increasing focus on how buildings affect the core business effectiveness over time. Changes and new needs in the core business will lead to new performance requirements. Today multiMap consists of several modules, which give information of a building/-portfolio regarding the portfolio performance and potential for future use (see figure 1), and several other modules is under development.

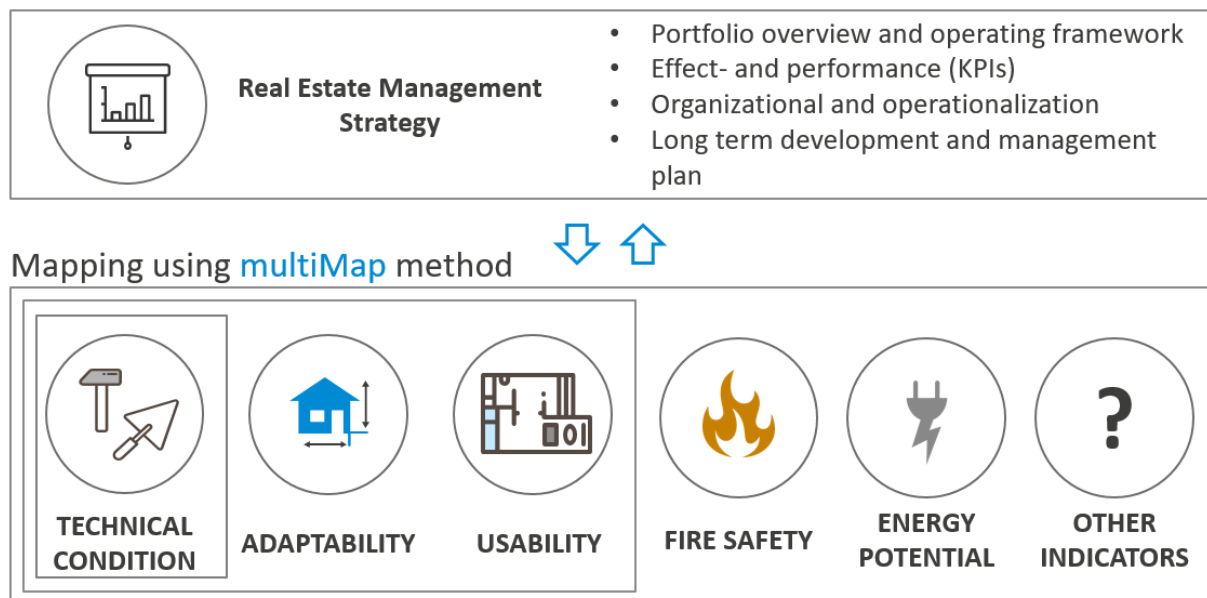


Figure 1: Different modules and module packages in MultiMap (Ref.: Multiconsult)

Totally, the tool has been used for approximately 30M m<sup>2</sup> (GFA) of buildings, but since the model is generic, it has also been used on roads and nautical installations in Norway.

The structure of all data is based on the Norwegian Standards (NS) such as NS 3424 “Condition Assessment of Construction Works” (2012), NS 3451 “Table of Building Elements” (2009), NS 3454 “Life Cycle Costs for Building and Civil Engineering Work” (2012) and NS 3457 “Table for Building categories” (1995). The first one, NS 3424, is the most central. It uses condition grading between 0 and 3. Condition grade 0 is equivalent to the best grade (new construction), and condition grade 3 corresponds to the lowest grade. Table 1 gives a general description of the condition grades in the standard.

| Condition grade | Description          |
|-----------------|----------------------|
| 0               | No symptoms          |
| 1               | Slight symptoms      |
| 2               | Medium-strong sympt. |
| 3               | Strong symptoms      |

Table 1: condition grades due to Norwegian Standard NS 3424

As mentioned, the model is generic. A building portfolio is divided into building types (schools, offices, hospitals etc.) and building elements (roof, façade, HVAC etc.). For roads division is road types and road elements, for park it will be park types and park elements and so on.

Significant amounts of information about such large number of buildings, roads or parks is present in existing knowledge in the FM organization and users. To systematize information and to establish an objective point of view, matrixes / forms for the assessment, including guidance, are developed. An example of a descriptive explanatory matrix is shown in table 2.

| FUNCTIONALITY - INTERNAL LOGISTICS |                                                                                                                                                                                          |                                                                                                                                                                            |                                                                                                                             |                                                                                                                                                                                             |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters                         | Grade 0                                                                                                                                                                                  | Grade 1                                                                                                                                                                    | Grade 2                                                                                                                     | Grade 3                                                                                                                                                                                     |
| Functions                          | The facilities contains the functions the organisation (user) needs, now and in the known future. No complaints from users.                                                              | The facilities contains to a high extent all necessary functions the users need in todays situation.. Only small amount of functions located in other facilities/building. | The facilities lack some essential functions, resulting in regularly use of other facilities/buildings.                     | The facilities does not give room for necessary functions. Large amount of essential functions located in other facilities/buildings. High amount of complaints/dissatisfaction from users. |
| Area/space                         | Sufficient area (m2) to support necessary functions satisfactorily, now and in the known future.                                                                                         | Sufficient area for todays functions.                                                                                                                                      | Amount of space (m2) is little. The spaces is small and well suited for the different functions. Low space/area efficiency. | Acute need of more space in order to perform necessary functions.                                                                                                                           |
| Design and shape                   | Design and technical solutions is a very good support to the core activity, today and in the known future. The internal logistics is good and the core activity can operate effectively. | Design and technical solutions is a good support to todays core activity. The internal logistics is good and does not hinder effective operation for the core activity.    | Design, shape and technical solutions is inexpedient. Essential functions is ineffectively located.                         | Design and technical solutions is inexpedient. Internal logistics is bad and results in ineffective operation of the core activity.                                                         |

Table 2: Example on an explanatory matrix, part of the Usability matrix. (Ref.: Multiconsult)

A sophisticated way of presenting results is to use BIM tools like Onuma Planning System together with Google Earth. Onuma Planning System provides the possibility to model buildings in 3D and adding information directly to the model itself. Google Earth provides the maps and possibility to synthesize building and location. In figure 2, as an example, technical condition is presented using colours on the building models surface. Each colour represent one of the condition degrees. This way of presenting results makes the information very easily understood. It is also possible to add information on different levels, like building site, municipality, county and country.

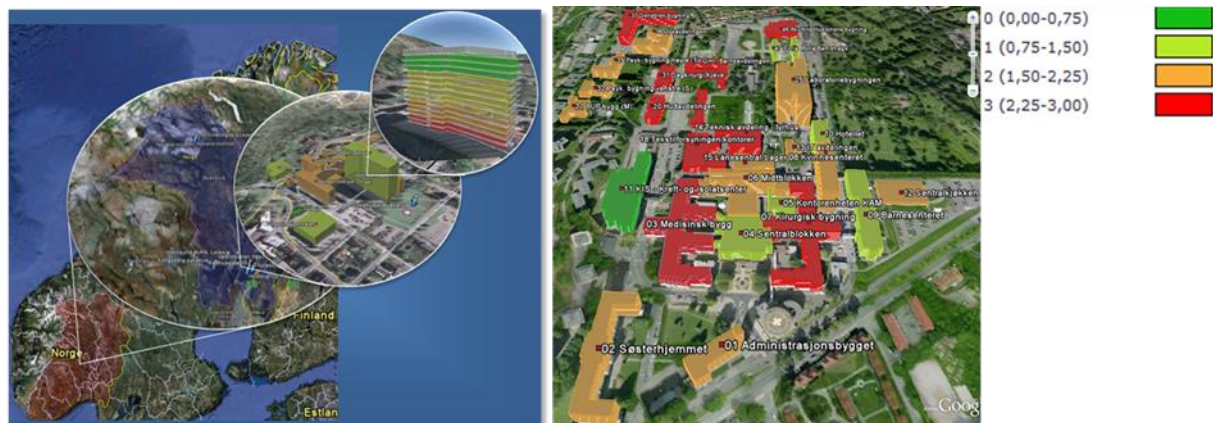


Figure 2: Presentation of results using Google Earth and Onuma Planning System (Multiconsult)

#### 10.2.4. Findings

In cooperation with Oslo municipality, a module for assessing technical conditions of parks and park elements has been developed. Oslo municipality is divided into several agencies and the agency responsible for (amongst other things) park management (Bymiljøetaten (BYM)) participated with several of their FM resources in the development and structuring of the module. Park types were previously established in the municipality and ranged from Type A, exclusive and high maintenance park, to Type D, more forested parks with less demanding upkeep. Note that pure woodlands and forests are not included in the portfolio. The central Norwegian Standard for the element structure was NS 3420-ZK *“Operation and maintenance of parks and gardens”* (2016). For every park element, a cost function was derived, that is based on a few attributes of each park. This cost function is essential in weighting and aggregating the condition grades to a comparable measure across the portfolio.

The mapping process was performed by BYMs own FM resources and supported by workshops and Multiconsult staff. Results of the mapping process and compared to other condition analysis were significantly less resource intensive. The complete results are utilized and analyzed internally in the BYM organization for strategic management, communication and resource / budget planning. Due to the flexible structure of the quantitative method, several other analyses may be performed and visualizations produced on demand. This way the message the organization wants to get across may be optimized based on the target group (internal / external, park professionals / laymen etc.).

#### Results part 1 – Portfolio overview

Clear and communicative portfolio overview contributes to a greater understanding internally in the organization and externally to political decision makers in the municipality. Challenges and difficulties, as well as the accomplishments and performance, are presented and traced over time. BYM management is segmented into divisions that are largely determined by geographic segments.

There were great diversities in the compositions of the different management divisions' portfolios. Of the 7 management divisions, portfolio m<sup>2</sup> ranged from 43% of total area to less than 3%. The smaller divisions' parks, however, were significantly more complex and consisted of proportionately more Type A parks. See figure 2 for visualization. This is naturally common knowledge for BYM, but the visualizations and the quantification of this information provides useful tools in gaining a common understanding of the organizations different needs for competence and resources and may be used for more in-depth analysis and external communication.

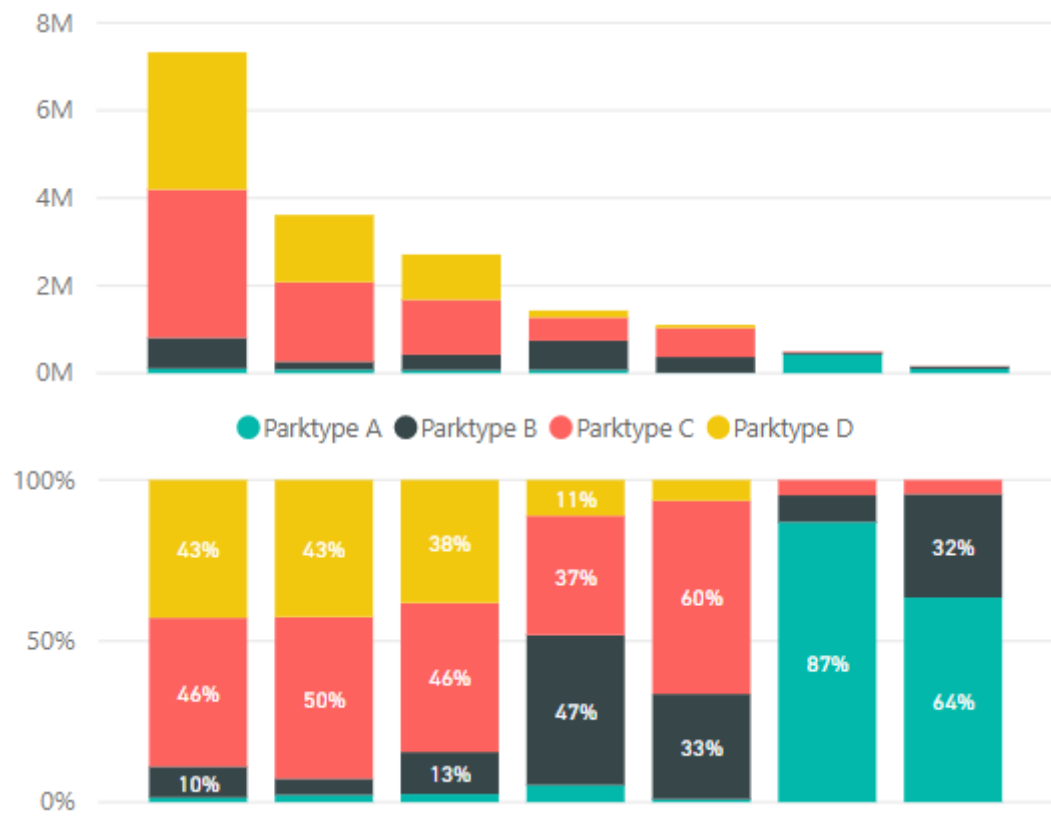


Figure 3: Composition of FM divisions' park portfolios within BYM (m<sup>2</sup> and relative ratios)

Type A parks are generally located closer to the city center and are generally more technically complex and with a higher gross technical value (unadjusted for condition). This creates different needs for capital that may not correlate with size. To illustrate this, the gross technical value of parks in different districts of Oslo is compared against gross park m<sup>2</sup> in the same districts. See figure 4 for illustration. This information is quantified and may be used in the budgeting process.

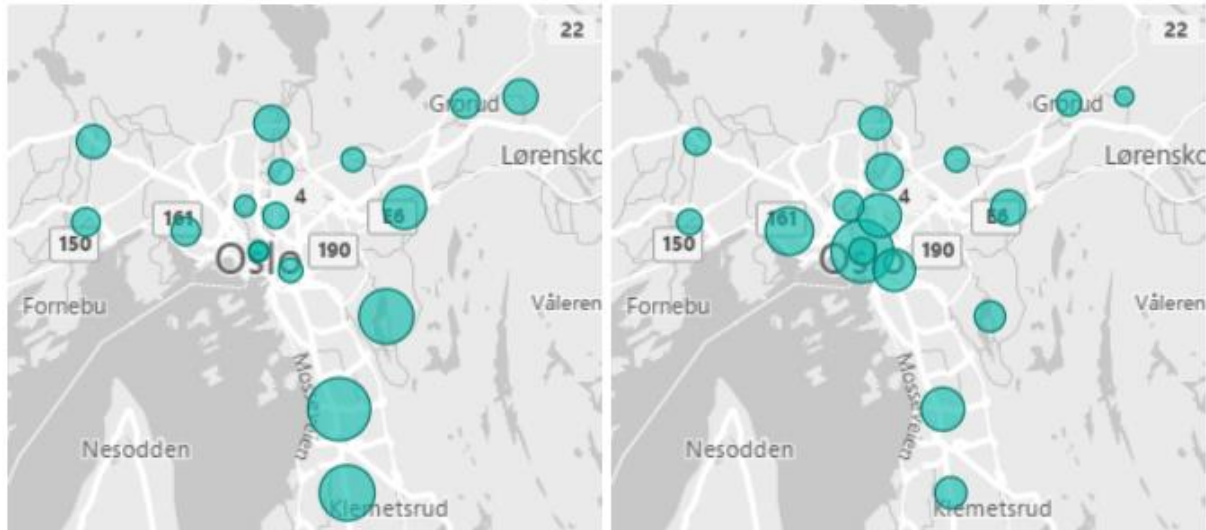


Figure 4: Visualizations of parks in geographical districts by area (left) and gross technical value (right)

### Results part 2 – Technical conditions

The technical conditions of parks are closely related to degree of upkeep. We have defined maintenance needs as a separate need from general need for general upkeep (such as mowing grass, shoveling snow, trimming hedges etc.). It is generally defined as maintenance need when a greater effort than normal upkeep is required to restore the element to condition grade 1. The aggregate weighted technical condition grade of the entire portfolio, is presented in Figure 5.

Aggregate weighted technical condition grade

1,37

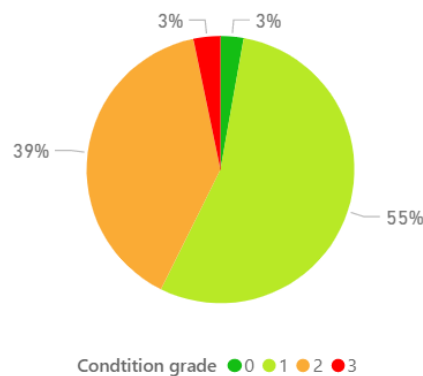


Figure 5: Total grade (top number) and park area in the different grades (pie)

This grade and data may be separated by management division, geographical district, park types and any other relevant assortments of parks. The interpretation of the result depends on the municipalities ambition levels for certain parks. For instance may Park type A have a lower grade ambition than park type D. We see that over half of the parks are in good to satisfactory condition (grade 0 to 1), almost 40% is in unsatisfactory condition, and 3% is in poor condition. In Figure 6 we see that this distribution varies greatly across geographical districts.

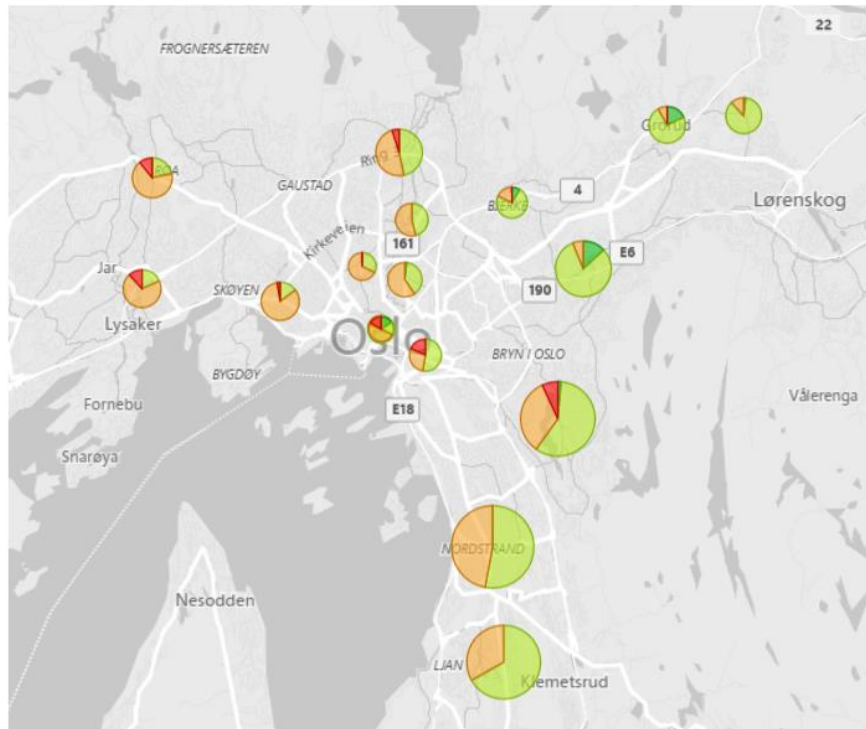


Figure 6: Park area in the different grades in different geographical districts (pie size = total m<sup>2</sup>)

Figure 7 shows the same information distributed across management divisions.

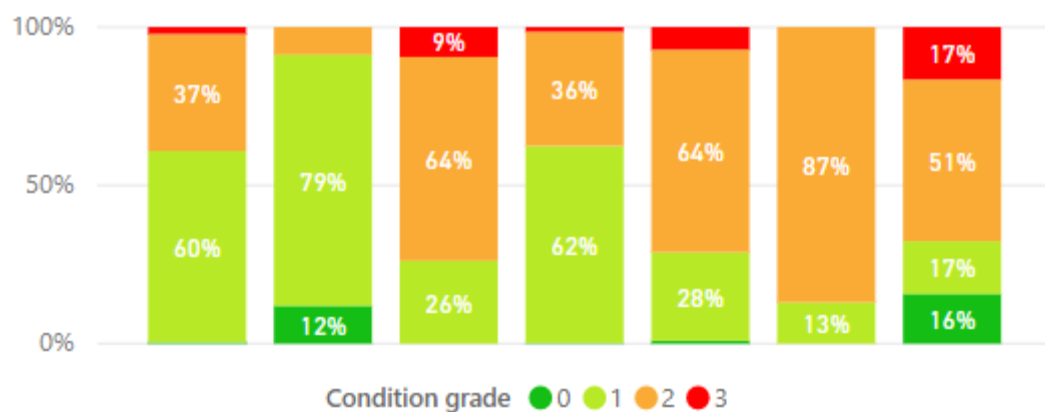


Figure 7: Park area in the different grades in the different management divisions

### Results part 3 – Maintenance capital needs

Elements and components with condition grade 3 are considered immediate needs and is recommended repaired/restored within a 5-year period. Elements with condition grade 2 is recommended restored within a 5-10 year period. Note that elements with condition grade 2 is not necessarily a maintenance backlog, but may be due to natural causes such as the component nearing its intended lifetime and is planned to be replaced. An ambition of no elements with condition grade 2 is therefore unrealistic. Elements in condition



grade 0 and 1 are assumed maintained by normal upkeep and is not included in further calculations. Values are in NOK (2018) and are early estimates in the budgeting process.

Figure 8 presents the maintenance capital needs of the different maintenance divisions in BYM.

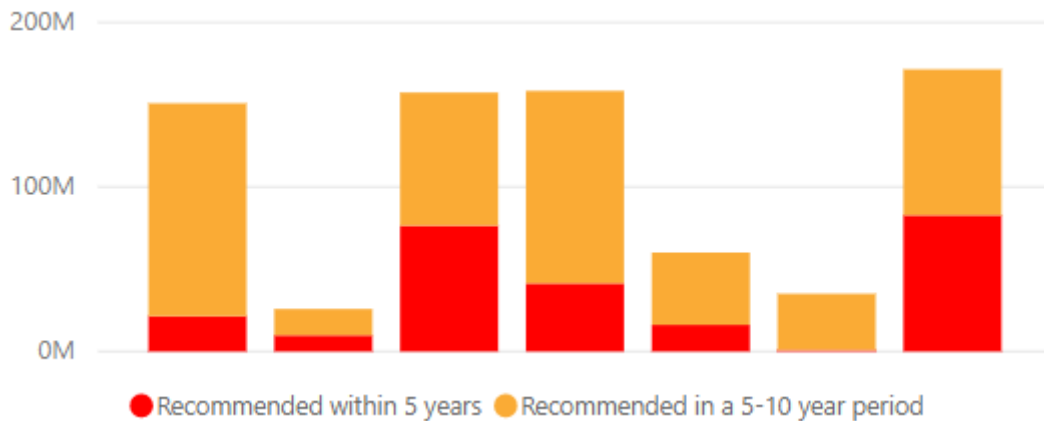


Figure 8: Maintenance capital needs of different management divisions

#### 10.2.5. Reliability and validity of results

The degree of uncertainty in these calculations make the values suitable for strategic use as orders of magnitude, but not as direct inputs in the budget process. Concrete actions needs to be defined, structured and cost estimated, preferably with the mapped conditions as basis. Because of the amounts of parks (close to 800) the uncertainty of cost calculations for the entire portfolio is somewhat mediated by the law of large numbers. In figure 9, uncertainty is shown in % as a function of amount of objects. For less than 20 objects, the uncertainty is 35-15 % but above 40 parks, it drops down closer to 10 %.

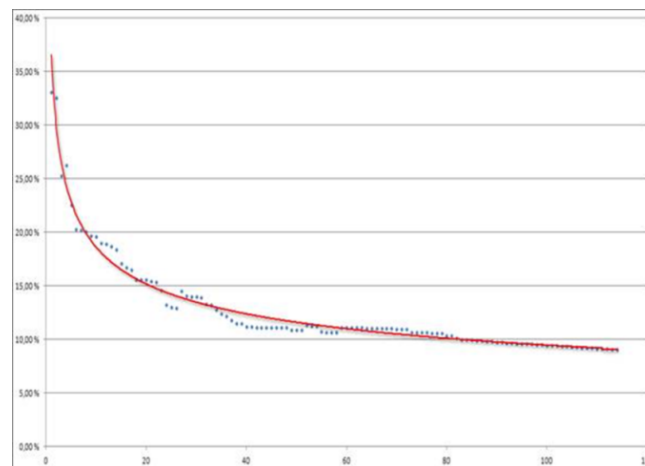


Figure 9: Uncertainty of cost mapping portfolio (Multiconsult)

#### 10.2.6. Discussion

A main objective has been to provide tools that can strengthen the strategic FM practice and bridge the gap between needs for users of urban areas by urban FM services. So far the results from practice has shown that the active approach to backlog and the way results are communicated to decision makers as shown is effective, and is being used actively in strategic planning. The tools may also be effective for FM-personnel in their daily work, as an aid in the dialog with users, but this requires a shift in practice towards an active strategic role which is not so common today.

As the multiMap method is generic, but there is a need for a module assessing social aspects. To do that it is a need to define classification of social groups and - elements.

### 10.2.7. Conclusions

The assessment method described in this paper cover a need that is becoming increasingly more important as the focus of FM shifts towards strategic FM and added value for users of urban areas. The multiMap method has proved to be an excellent tool for mapping technical condition as a base for estimation of maintenance backlog in portfolios and as a first scan of single buildings and urban areas ie all space between buildings (parks, roads etc). Presenting results in 3D BIM and Google Earth has proved to be communicative.

Further development should focus on social aspects due to changing needs during people's life (Life Cycle Social Needs). Children, grown-ups and elderly people (social "types") has different needs (social "elements") that shall be satisfied in urban context. Sustainable FM is more than energy efficiency, upgrading of maintenance backlog of the building itself, it is combination with quality of interaction between economy; environment and the social aspects so obtain well-being in buildings an campuses. The role of Urban FM is an expansion of services for all stakeholders in urban areas. This has to be understood and accepted as an important actor by all stakeholders in urban areas

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### 10.3. Roadmap datagedreven vastgoedsturing gemeente Groningen

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Om haar doelstellingen te behalen en op professionele wijze om te gaan met haar vastgoed wil het Vastgoedbedrijf van de gemeente Groningen op een innovatieve manier gaan sturen op de maatschappelijke vastgoedportefeuille. Het gebruik van data en informatietechnologieën, oftewel datagedreven werken en sturen geeft inzicht in de effectiviteit en efficiëntie van de portefeuille. Deze roadmap omvat, naast een theoretisch kader, een stappenplan waarmee het proces naar data-gedreven vastgoedsturing wordt beschreven. Uitgangspunt hierbij is stapsgewijs uitvinden aangezien datagedreven vastgoedsturing vraagt om een andere manier van denken en doen. Er worden *actionable insights* gecreëerd zodat strategisch sturen mogelijk wordt. Het te ontwikkelen datamodel vormt de basis voor het aangaan van de dialoog, het nemen van beslissingen en het opstellen van lange termijndoelen. De uitkomst is een datamodel voor een proactieve, wendbare, toekomstbestendige organisatie die in staat is in te spelen op een veranderende omgeving en stuurt op een zo hoog mogelijk maatschappelijk rendement.

De opkomst van *Big Data* en vooral *Smart Data* stelt ons in staat om op een andere manier inzicht te verkrijgen in wat er in de toekomst gaat gebeuren en hierin te sturen. *Smart Cities*, slimme apparaten en andere voorbeelden van *Internet of Things* - niet alleen mensen zijn online, maar ook dingen - genereren waardevolle data en maken dat dit eenvoudig gedeeld kan worden. En de introductie van *Blockchain* in het vastgoed zorgt bijvoorbeeld voor een andere manier van waardeoverdracht (Veuger, 2017). Het zijn voorbeelden van de inzet van data en technologische mogelijkheden die zorgen voor grote veranderingen en invloed hebben op en potentiële waarde - transparanter, professioneler, objectiever - hebben voor de vastgoedwereld. Maar hoe kan de gemeente Groningen nieuwe data en informatietechnologieën gebruiken om strategisch te sturen op de maatschappelijke vastgoedportefeuille?

#### 10.3.1. Ambitie

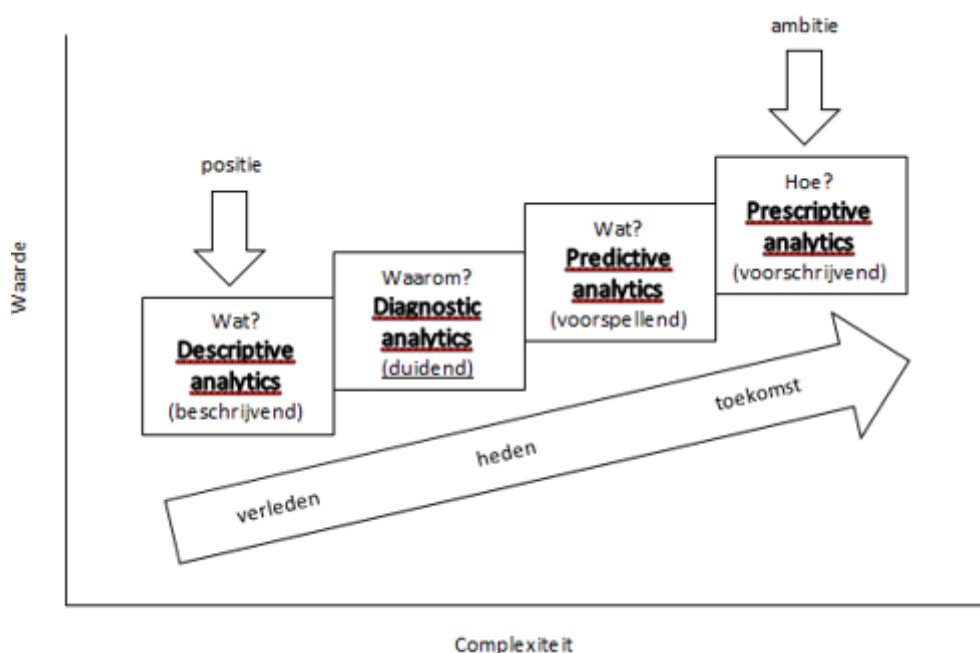
De gemeente Groningen bezit en gebruikt een (maatschappelijke) vastgoedportefeuille om maatschappelijke doelstellingen mee te behalen. Daarnaast is er vanuit een meer bedrijfseconomisch perspectief sprake van financiële en programmadoelstellingen. Zo is vastgoed bijvoorbeeld een middel om mensen te verbinden of om bewegen en beleven mogelijk te maken voor iedereen - maatschappelijk -, maar vastgoed is ook onderdeel van de duurzaamheidsambitie en bezuinigingsopgave - financieel en uitvoering -. Het Vastgoedbedrijf van de gemeente Groningen (hierna: het Vastgoedbedrijf) is faciliterend en heeft als taak om centraal inzicht en sturing te geven aan de maatschappelijke vastgoedportefeuille. Belangrijk hierbij is het bepalen van een richting voor de lange termijn, keuzes te maken en het toewijzen van middelen. Er is al langere tijd het besef dat een professionelere manier van sturing noodzakelijk is (Veuger, 2013). Strategische portefeuillesturing is niets meer en niets minder dan sturen op effectiviteit (in hoeverre draagt het vastgoed bij aan de primaire doelen) en efficiëntie (hoe goed doet het vastgoed het) (Wildenberg, 2017). Het Vastgoedbedrijf wil dit gaan doen door op een andere (innovatieve) manier gebruik te maken van data en informatietechnologieën. De ambitie kan als volgt worden gedefinieerd:

*Het Vastgoedbedrijf wil datagedreven sturen op de vastgoedportefeuille zodat op professionele wijze maatschappelijke, financiële en programmadoelstellingen behaald worden (oftewel effectief en efficiënt omgaan met maatschappelijk vastgoed).*

Met datagedreven sturen wordt hier het sturend handelen bedoeld gebaseerd op het systematisch verzamelen, beheren, analyseren en interpreteren van data bedoeld gelijk aan de definitie van de VNG

(VNG, 2018). Het gaat om de juiste combinatie van data, techniek en kennis. Data kan met de juiste techniek omgezet worden naar informatie. Door deze informatie in zijn context te plaatsen kunnen verbanden gelegd worden en krijgt de informatie betekenis. Er ontstaat kennis en kennis leidt uiteindelijk tot waardevolle inzichten en maakt handelen (sturen) mogelijk.

Het gebruik van data en informatietechnologieën kan inzicht creëren in de effectiviteit en efficiëntie, maar dit gaat niet vanzelf. Figuur 1 laat de weg zien die nodig is om te komen tot inzichten die acties mogelijk maken (*actionable insights*).



Figuur 2: Weg naar actionable insights (eigen vertaling van Gartner)

De gemeente Groningen bevindt zich nog voornamelijk in de beschrijvende fase, zowel organisatiebreed als binnen het Vastgoedbedrijf. Data helpt ons op dit moment voornamelijk om te laten zien wat er gebeurd is. Het geeft inzicht, bijvoorbeeld als uit de data blijkt dat er sprake is van een negatief financieel rendement (uitvoeringsniveau) of een terugloop in het aantal bewegende kinderen (beleidsniveau). Om dit vervolgens te kunnen duiden, moet gekeken worden naar het waarom (*diagnostic analytics*). Is de huurprijs niet voldoende om de kostprijs te dekken en/of zijn bijvoorbeeld de onderhoudskosten te hoog? Of in het tweede geval: is de afstand tot de dichtstbijzijnde sportaccommodatie te groot of sluit het aanbod niet aan op de doelgroep? Uiteindelijk willen we via de weg van het wat en waarom weten waar we naartoe moeten en hoe we daar kunnen komen. We komen niet voor verrassingen te staan, we weten wat de toekomst brengt (*predictive analytics*) en kunnen die toekomst naar onze hand zetten (*prescriptive analytics*).

### 10.3.2. Proces

De weg naar datagedreven vastgoedsturing is een proces dat gebaat is bij een stappenplan. Het stappenplan volgt de eenvoudige principes van plannen, experimenteren, evalueren en reageren oftewel de Plan, Do, Check en Act cyclus (PDCA-cyclus) van Deming. Feitelijk staat de gemeente Groningen aan het begin van de tweede stap zonder dat de eerste stap daadwerkelijk is afgerond. Dit past binnen een dynamisch traject van veranderen en verbeteren ook bekend als respectievelijk *Agile* en *Lean* (beiden zijn filosofieën waarmee flexibel sturing en uitvoering gegeven kan worden aan projecten).

Belangrijke opmerking vooraf is dat er binnen het traject een sterk beroep wordt gedaan op stapsgewijs uitvinden. Een andere manier van denken en doen zonder exact beeld van het einddoel is een proces van ontdekken. Immers, het klassieke data-informatietraject kenmerkt zich door het ontsluiten van data om er vervolgens een informatieproduct van te maken. De (toekomstige) gebruiker is in staat om aan te geven wat zijn eisen en wensen zijn en heeft een beeld van het eindproduct. Terwijl dit in het geval van

datagedreven vastgoedsturing niet per definitie het geval is (Damhof, 2016). Een startpunt vanuit het Vastgoedbedrijf kan in grote lijnen wel gegeven worden. Met behulp van prestatie indicatoren en *activity drivers* kan worden aangegeven welke sturingsinformatie minimaal vereist is (zie figuur 2 onder stap 2). Prestatie indicatoren laten zien of een doel bereikt is, ze geven een uitkomst - de match tussen prestatie en doel - op basis van het verleden. Om te kunnen sturen is vervolgens ook inzicht nodig in welke factoren invloed hebben op die uitkomst, de *activity drivers*. *Activity drivers* geven inzicht in het tussenliggende proces en zijn de knoppen waaraan gedraaid kan worden. In het voorbeeld van wederom het financiële rendement geldt dat onder andere huurinkomsten, onderhoudskosten en energieverbruik factoren zijn die hier invloed op hebben. Het monitoren van deze *drivers* levert waardevolle sturingsinformatie op het gebied van de efficiëntie van het vastgoed. Tegelijkertijd wil je ook informatie over de effectiviteit en uiteindelijk is tevens een meer voorspellend model met bijvoorbeeld scenarioschetsing nodig. De knoppen en andere eisen en wensen moeten gaandeweg het proces steeds meer vorm krijgen en tegelijkertijd veranderen de op basis van data verkregen inzichten dit ook weer.

#### *Stap 1: Plan*

Voordat de weg naar *actionable insights* überhaupt kan worden bewandeld is het belangrijk om in te zien wat data en data-analyse kan toevoegen aan beleid en uitvoering en een visie te hebben op data en digitalisering. Bovenal is (politieke) agendering en het bepalen van een richting van belang. Organisatiebreed erkent de gemeente Groningen de waarde van data en zijn wij ons bewust van de potentie van datagedreven werken en sturen. Er ligt een visie (Virtueel Groningen 2022, Gemeente Groningen 2017) en krachten worden gebundeld zowel intern tussen afdelingen als extern met bijvoorbeeld het CBS in het Urban Data Center of de Rijksuniversiteit Groningen in het Urban Gro Lab. De visie geeft aan waar we naartoe willen (onder andere datagedreven werken en sturen), maar niet hoe we daar precies komen en wanneer we wat moeten doen. Om de visie op digitalisering bruikbaar te maken voor deze roadmap is een eigen vertaling gemaakt naar maatschappelijk vastgoed wat ons inziens neerkomt op de volgende uitgangspunten:

1. Maatschappelijk rendement wordt behaald door maatwerk in de zin dat bijvoorbeeld aangesloten wordt op de behoeften in een wijk of wensen van de gebruiker (de match tussen vraag en aanbod).
2. Maatwerk is mogelijk als trends, patronen, behoeften en wensen inzichtelijk zijn en gemonitord worden.
3. Bij monitoren hoort de mogelijkheid tot bijsturen en inspelen op veranderingen en trends. Dit vraagt naast een flexibele organisatie ook om flexibel vastgoed. Hier zit een uitdaging aangezien een gemeentelijke organisatie doorgaans minder wendbaar is (onder andere door politieke- en beleidscycli) en bijvoorbeeld beslissingen in vastgoed een langere tijdshorizon kennen. De organisatie moet in staat zijn om te kunnen handelen naar verkregen inzichten, maar het vastgoed zelf moet ook kunnen meebewegen. Denk aan multifunctioneel gebruik, andere vormen van huurcontracten en herindeelbaarheid, maar ook aan het hergebruik van materialen middels een gebouwenpaspoort.
4. Door monitoren ontstaat data en deze data moet gestandaardiseerd en beschikbaar zijn op een centrale plek, bijvoorbeeld in de vorm van één digitaal model van de stad. Transparantie over welke data, op wat voor manier en waarom wordt gebruikt is hierbij belangrijk (Kool, Timmer en Van Est, 2015).
5. Inwoners/gebruikers zijn steeds vaker en makkelijker via digitale kanalen te bereiken. Hier zitten ons inziens twee kanten aan. Enerzijds vergemakkelijkt dit het verzamelen van data en het leveren van maatwerk. Anderzijds ontstaat de vraag of al het fysieke vastgoed (m<sup>2</sup>) nog noodzakelijk is als bijna iedereen elkaar digitaal kan bereiken, bevragen en betrekken (eigenaar – gebruiker, overheid – burger en inwoner – inwoner).
6. Vastgoed heeft een faciliterende rol, het gaat om het verlenen van een dienst. Hierdoor kan, in theorie, wellicht het in eigendom hebben van vastgoed niet altijd per se noodzakelijk zijn.
7. Het gebruik van externe data/*Big Data* (CBS, Kadaster en andere databronnen) is noodzakelijk om een compleet beeld te schetsen en (eigen) data te kunnen duiden. *Big data* kent vele definities, maar kenmerkend is in ieder geval de analyse van grote hoeveelheden, snel veranderende, complexe data door gebruik te maken van nieuwe technieken. Het kan gezien worden als uniek

mechanisme dat de wereld om ons heen kan duiden en ons in staat stelt om voorspellingen te doen. (Klous & Wielaard, 2014).

8. Er moeten innovatieve initiatieven ontwikkeld worden en/of er moet aangehaakt worden bij initiatieven als *sensing (Internet of Things (IoT))*, *data-analytics* (datalab, datamining en *machine learning*) en *Blockchain*. *Machine learning* is een techniek waarbij computers in staat zijn om te leren van bekende en nieuwe data zonder dat zij daarvoor door de mens geprogrammeerd zijn. In- en output worden aan elkaar gekoppeld en patronen worden ontdekt. *Blockchain* is een technologie die transacties van gevalideerde data zonder tussenkomst van derden mogelijk maakt. Veuger (2017) deed een verkenning naar de potentiële disruptieve kracht hiervan op vastgoed. Een innovatiewerkplaats zoals die van de Hanzehogeschool of de challenges zoals neergelegd in het Startup in Residence programma - een samenwerking tussen overheid en startups - bieden ruimte om deze en andere initiatieven te ontwikkelen en samen tot oplossingen te komen.
9. Innovatieve initiatieven moeten een podium hebben en er moet een organisatie en omgeving zijn waar ruimte is voor experimenten en fouten maken. Een type experiment dat op termijn - bijvoorbeeld in stap 4 - gebruikt kan worden is het living lab, een levensechte experimenteeromgeving om oplossingen te testen (Est, R. van et al., 2018). Het Urban Gro Lab is de proeftuin van de stad Groningen.
10. Zowel intern als extern moet de samenwerking gezocht worden, zodat flexibele kennisnetwerken ontstaan. Interne agendering en coalitievorming, maar ook de samenwerking met kennisinstellingen als de Rijksuniversiteit Groningen, Hanzehogeschool en IT Academy Noord-Nederland en marktpartijen zoals in beide voorgaande actiepunten beschreven is waardevol.

Datagedreven werken en sturen is geen doel op zich, maar een middel naar het hogere doel. Uiteindelijk gaat het om het creëren van een zo hoog mogelijk maatschappelijk rendement. Maatschappelijk rendement is de verhouding tussen investering in geld, mensen en middelen enerzijds en maatschappelijk effect anderzijds. Welke maatschappelijke effecten behaald moeten worden met het maatschappelijke vastgoed en of deze behaald worden is aan het bestuur en de beleidsafdelingen/programma's (effectiviteit). Het is aan het Vastgoedbedrijf om iets te zeggen over geld en middelen (efficiëntie).

Stakeholder voor deze eerste stap is de gehele organisatie met als voorwaarden investeren in data-governance (visie, spelregels) en samenwerken.

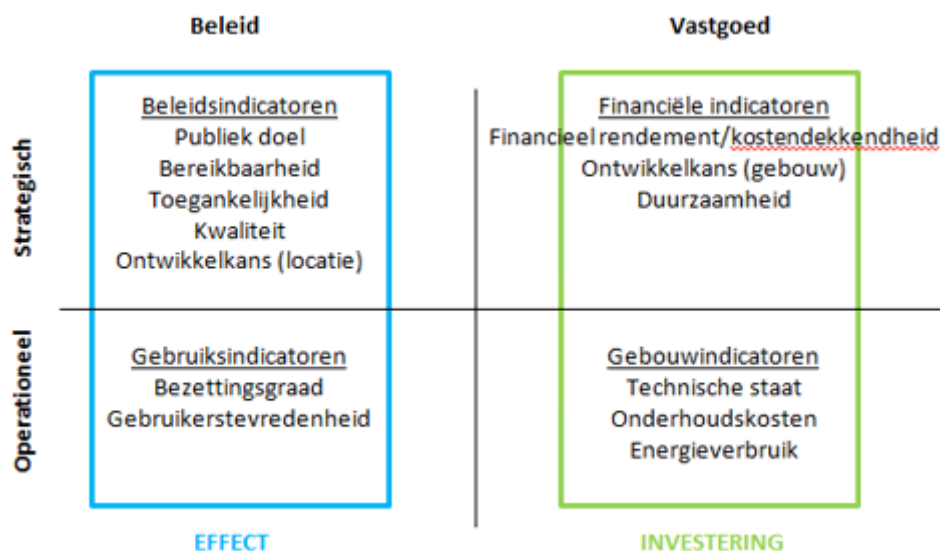
#### *Stap 2: Do, datagedreven werken*

De volgende stap is om niet te blijven nadenken over de mogelijkheden, maar te gaan doen. Niemand weet wat precies mogelijk is en wat de exacte uitkomst moet zijn, maar het gaat zoals gezegd om stapsgewijs uitvinden. Hier wordt de stap gezet naar datagedreven werken. Voorwaarde hierbij is uiteraard wel dat de data beschikbaar en bruikbaar is, oftewel dat de basis op orde is. Tegelijkertijd geldt ook dat de veranderingen en ontwikkelingen zo snel gaan dat van tevoren alles hebben en weten niet (meer) realistisch is. Door te experimenteren, leren we en dat is ook wat al op veel plekken binnen de organisatie gebeurt. Specifiek gericht op vastgoed lopen op dit moment in ieder geval de volgende sporen gericht op het ophalen en ordenen van data:

- Inrichten financiële module DaFinci (Vastgoedbedrijf)
- Gemeentelijke benchmark (Vastgoedbedrijf en TIAS Business School)
- Bepalen van en inzicht in kritische prestatie indicatoren en *activity drivers* (Vastgoedbedrijf)
- Monitoren energieverbruik via slimme meters (Gresco)
- Leesman: onderzoek werkplekeffectiviteit en gebruikerstevreden gemeentelijke gebouwen (Vastgoedbedrijf en SSC Facilitaire Services & Huisvesting)
- Stadskompas/basismonitor (Directie Maatschappelijke Ontwikkeling/Stadsontwikkeling)
- Urban Data Center (Onderzoek, Informatie & Statistiek en CBS)
- Verstening van de stad (Geo-informatie en Kadaster)
- Monitoren Karding (Sport050)

Data maakt het mogelijk om feitelijke uitspraken te kunnen doen over en te kunnen sturen op de effectiviteit en efficiëntie - oftewel het maatschappelijke rendement - van de vastgoedportefeuille. De

gedachte is te beginnen met het meten van de portefeuilleprestaties aan de hand van de vier indicatoren zoals weergegeven in figuur 2. Per indicator zijn voorbeelden gegeven van prestaties die gemeten worden. De opsomming is niet vaststaand of uitputtend, maar is een afspiegeling van de behoefte zoals die nu aanwezig is binnen de gemeente Groningen. Het is denkbaar en zelfs wenselijk dat nieuwe prestatie indicatoren gaandeweg worden toegevoegd zoals dat past in een dynamisch proces.



Figuur 3: Prestatie indicatoren afgezet naar niveau en deskundigheid (eigen vertaling van bbn adviseurs/VastgoedMaps en Republiq)

Datavisualisatie van de prestatie indicatoren in de vorm van een digitaal dashboard is een tastbare eerste stap. Met betrekking tot een aantal indicatoren en met name op strategisch niveau, is al bruikbare data beschikbaar, dus er wordt begonnen met wat beschikbaar is. Er ontstaat een tool waarop aangehaakt kan worden. Juist omdat de ontwikkelingen van bijvoorbeeld data inventarisatie en -verzameling (*IoT*) zo snel gaan, moet er ruimte gelaten worden om nieuwe inzichten en systemen toe te kunnen voegen. De ontwikkeling en uitrol vindt plaats in de vorm van een project met behulp van in ieder geval een informatie-adviseur en data-analist. In deze stap wordt data omgezet naar informatie.

Belangrijke opmerking hierbij is dat hoewel sprake lijkt van een meer technische exercitie, stap 2 (en stap 3) gezien moet worden als gezamenlijk leerproces. De stappen bieden de gelegenheid om te oefenen met *evidence based* denken, werken en beslissen. Wij leren de mogelijkheden van data en informatietechnologieën verder ontplooiën, oftewel het maakt ons meer datageletterd. De complexiteit en onvoorspelbaarheid van zowel de materie als het datamodel vereisen een hoog verandervermogen. De veranderstrategie die in dit geval het best geschikt is, is de interactieve strategie volgens het model van Boonstra (2017). Kenmerkend voor deze vorm is het interactief uitwisselen van kennis en ideeën op basis van verbeeldingskracht en toekomstvisie.

Een laatste opmerking is dat ook nadrukkelijk oog moet zijn voor wat mag (juridica) en wat de gemeente Groningen wil (ethiek). Qua juridica geldt dat iedere gemeente (en andere partijen) zich aan wetten moet houden zoals bijvoorbeeld de Algemene Verordening Gegevensbescherming (AVG). Helder moet zijn welke data de gemeente mag opvragen, opslaan en gebruiken zodat duidelijk is dat de wenselijke en beoogde data ook bruikbare data is. In het verlengde hiervan geldt ook het belang van data-eigenaarschap. Helder moet zien wie rechtmatig eigenaar is zodat verantwoordelijkheid en kwaliteit gewaarborgd zijn. Naast wetgeving, speelt ook ethiek een belangrijke rol in de omgang met data en informatietechnieken. Schäfer (2017) merkt op dat het goed is dat beslissingen op basis van verifieerbare feiten worden genomen, maar

waarschuwt tegelijkertijd ook voor de schijnbare objectiviteit die data, data-analyse en -visualisatie biedt. Het is aan ons om ethisch om te gaan met data en bijvoorbeeld waarde vrije aannames (bevatten geen waardeoordeel) te gebruiken en stigmatisering (brandmerken van groepen en/of individuen) te voorkomen (Feenstra, 2018).

Stakeholders voor deze tweede stap zijn Vastgoedbedrijf, Directie Maatschappelijke Ontwikkeling, Stadsontwikkeling, Onderzoek, Informatie & Statistiek, Geo-informatie en externe partij(en). Voorwaarden zijn dan basis op orde (onder andere DaFinci), investeren in data-infrastructuur (Datawarehouse), investeren in data-competenties (data-analist) en datageletterdheid, aandacht voor juridica en ethiek en samenwerken met interne en externe partijen.

### *Stap 3: Check*

Deze fase is tweeledig. Enerzijds gaat het om een meer data-technische evaluatie. Hebben we de juiste data tot onze beschikking? Wordt de data op de juiste manier aan elkaar gekoppeld? En mogen en willen wij de data op deze manier gebruiken? Het resultaat van deze stap kan zijn dat bijvoorbeeld een andere manier van dataverzameling of aanvullende data nodig is. Je gaat terug naar de vorige stap, in de zin van een opwaartse spiraal. Zeker in het begin is sprake van relatief korte sprints van experimenteren, evalueren en bijstellen. Anderzijds gaat het ook om een meer data-analytische evaluatie. Het gaat om de inzichten die uit de data gehaald kunnen worden oftewel om het betekenis geven aan de uitkomsten door data en kennis te combineren. Hier wordt de sprong gemaakt van *descriptive* naar *diagnostic analytics* (figuur 1). Door de prestatie indicatoren en *activity drivers* worden patronen en ontwikkelingen zichtbaar. Hier wordt duidelijk wat waarom gebeurt en er kan antwoord gegeven worden op de vraag of we op de juiste manier omgaan met onze vastgoedportefeuille.

Stakeholders voor deze derde stap zijn in ieder geval Vastgoedbedrijf, Directie Maatschappelijke Ontwikkeling, Stadsontwikkeling en Onderzoek, Informatie & Statistiek. Voorwaarde is het investeren in datageletterdheid.

### *Stap 4: Act, datagedreven sturen*

Uit de vorige stappen komt naar voren dat data leidt tot informatie en informatie tot kennis middels data-analyse. Uiteindelijk gaat het om het anticiperen op de inzichten die hieruit zijn verkregen. De inzet is het maken van een analytisch model met voorspellende waarde waardoor strategisch sturen mogelijk wordt gemaakt. Met behulp van een data-scientist kan data met behulp van *machine learning* en algoritmes omgezet worden naar een voorspellend model. De verklarende kenmerken en patronen uit de vorige stap maken kansen en risico's zichtbaar en scenario's kunnen worden geschetst. De tool vormt de basis voor beslissen, ingrijpen en (bij)sturen en geeft vervolgens ook weer inzicht in de effecten hiervan. Het fungeert tevens als monitor.

Hier wordt de stap gezet naar daadwerkelijk datagedreven sturen. Welke beleidsaanpassingen achten we nodig? En welke acties zijn noodzakelijk om ons vastgoed beter in te zetten zodat de doelstellingen behaald worden? Hier wordt de sprong gemaakt naar *predictive en prescriptive analytics*. De focus wordt meer toekomstgericht. Een punt dat bij deze stap ook zeker de aandacht verdient is dat bij datagedreven sturen een ander handelingsperspectief hoort waaronder multidisciplinair samenwerken, snel beslissen en actief handelen. Want als uit de verkregen inzichten blijkt dat een bepaalde (beleids)aanpassing of actie noodzakelijk is, wachten we dan tot een volgend moment in de cyclus (met het risico dat dingen alweer veranderd zijn) of kunnen we direct bijsturen (Feenstra, 2018)? Datagedreven vastgoedsturing vereist een bepaalde vrijheid om te kunnen handelen - minder regels, minder vaststaande routes en schijven waarlangs beslissingen worden genomen - en meer flexibele cycli en vastgoed. Hoe dit vorm moet krijgen en hoe we hier invulling aan geven is iets wat gedurende het proces duidelijk moet worden.

Stakeholders voor deze vierde stap zijn in ieder geval Vastgoedbedrijf, directie Maatschappelijke Ontwikkeling en Stadsontwikkeling en Onderzoek, Informatie & Statistiek. Voorwaarden zijn investeren in data-competenties (data-scientist), flexibele organisatie en flexibel vastgoed.



### 10.3.3. Conclusie

Datagedreven vastgoedsturing is een innovatieve manier van omgaan met een veranderende omgeving en past binnen een bredere organisatielijin van datagedreven werken en sturen. Het vereist een combinatie van de inzet van data en informatietechnologieën, organisatieaanpassingen en een andere manier van samenwerken met interne en externe partijen (inclusief burger). Er wordt een andere overheid verwacht, door Hiemstra (2015) ook wel een *smart government* genoemd. De ontwikkeling brengt een aantal bewegingen en verschuivingen met zich mee. Tabel 1 geeft een voorstelling van een aantal belangrijke veranderingen vertaald naar de gemeente Groningen.

|                                      | Gemeente Groningen nu                                                                      | Gemeente Groningen 2019-2022                                                                                   |
|--------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Organisatie</b>                   | Losstaande eenheden/afdelingen (bestuur, beleid en uitvoering), hiërarchie, intern gericht | Netwerk van professionals, flexibele projectteams o.b.v. kennis en commitment, zowel intern als extern gericht |
| <b>Communicatie</b>                  | Verticaal, <i>top-down</i> , gesloten                                                      | Horizontaal en verticaal, <i>bottom-up en top-down</i> , transparant                                           |
| <b>Informatie</b>                    | Data om te verantwoorden                                                                   | Data om te beslissen, realiseren en innoveren                                                                  |
|                                      | Losse data(sets) en weinig koppeling                                                       | Slimme combinatie eigen data, <i>Big Data</i> en nieuwe data                                                   |
| <b>Beleidsvorming</b>                | Lang proces (formuleren en evalueren), inert                                               | Kort proces, alert                                                                                             |
| <b>Invloed</b>                       | Weinig; <i>ist-soll</i> situatie met black box daartussen                                  | Veel; tussen werkelijkheid en wenselijkheid wordt gemonitord en bijgestuurd                                    |
| <b>Besluitvorming</b>                | Ad hoc, reactief, <i>experience-based</i>                                                  | Vooruitziend, proactief, <i>evidence-based</i>                                                                 |
| <b>Innovatie</b>                     | Ondersteunt de bestaande manier van denken en werken                                       | Is driver voor nieuwe manier van denken en werken                                                              |
| <b>Datagedreven werken en sturen</b> | Datarevolutie, selectief gebruik                                                           | Is collectief gedachtengoed, onderdeel primair proces                                                          |

Tabel 1: Verschuivingen en bewegingen door datagedreven werken en sturen (eigen vertaling van Hiemstra)

Datagedreven werken en sturen gaat slechts voor een deel over techniek. Een belangrijke rode draad zowel in deze roadmap als bijvoorbeeld in de *smart government*-gedachte is dat zowel het datagedreven werken en sturen op zich als het proces er naartoe vraagt om een fundamenteel andere manier van denken en doen. Er wordt gevraagd om andere competenties, andere omgangsvormen en andere processen. Onder meer veranderdeskundigen Boonstra (2014) en Caluwé (2009) geven aan dat de cultuur van een organisatie geen ongrijpbaar verschijnsel is en veranderbaar is zolang er maar geen sprake is van opgelegde gedragsverandering. Mensen van bovenaf vertellen en opleggen wat ze moeten doen is zinloos. Het mensen gaandeweg gedurende een gezamenlijk interactief proces (onbewust) zelf laten ervaren en doen, zoals via het hierboven beschreven stappenplan, werkt wel. Het traject naar datagedreven vastgoedsturing is een voorbeeld van doen, leren en veranderen en kan als katalysator werken voor de algehele organisatietransitie.

In lijn hiermee geldt dat het algemene programma van datagedreven werken en sturen door gemeenten veelal volgens eenzelfde innovatiepatroon wordt ontwikkeld. 'Dit patroon is dat van (1) agendering en coalitievorming; (2) experimenteren (...) met concrete projecten; (3) verbreden en verankeren binnen de organisatie' (VNG, 2018). De VNG merkt tevens op dat landelijk gezien nog geen enkele gemeente zich bezig houdt met de verbreding en verankering. De koplopers houden zich bezig met meerdere datapilots met name binnen het sociale en publieke domein (leefbaarheid, veiligheid, zelfredzaamheid). Het merendeel van de gemeenten bevindt zich organisatiebreed nog in de eerste fase. De stad Groningen heeft in de vorm van een *Chief Digital Officer* een kwartiermaker die de digitale agenda vestigt en zorgt voor gezamenlijke

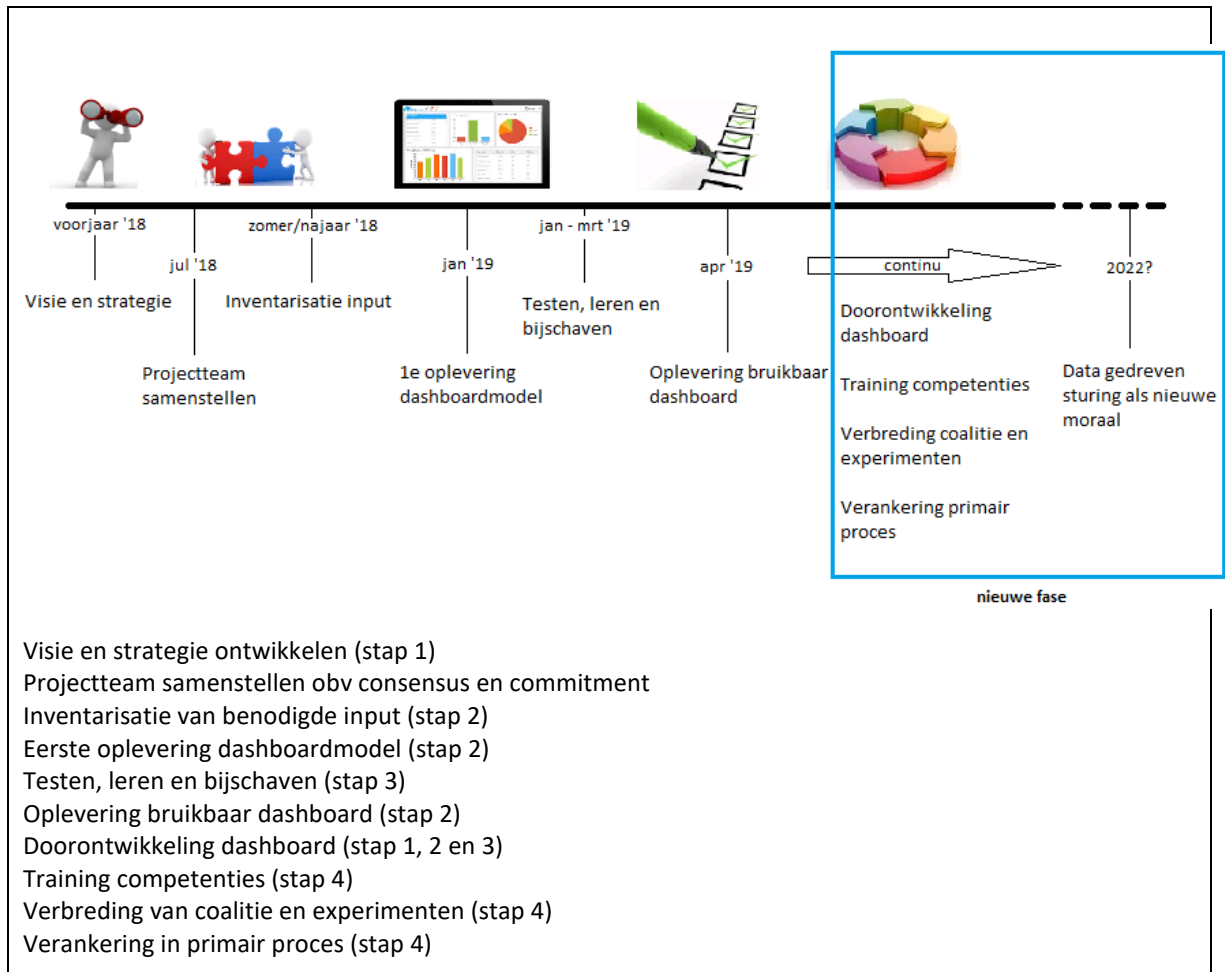
gerichtheid tussen marktpartijen, kennisinstellingen en overheid (1). Het team van het *Digital Office*, met daarin twee leden van de gemeente Groningen, heeft als doel om projecten in Noord-Nederland te initiëren en aan te jagen. Binnen de gemeente Groningen zelf lopen meerdere pilots en projecten en tegelijkertijd zijn wij ook nog bezig met de agendering en coalitievorming. Er gebeurt van alles op veel verschillende plekken binnen de organisatie, maar meer regie is wenselijk. Het verdient de aanbeveling om ter uitbreiding van of in aanvulling op het *Digital Office* een intern, organisatie breed programma te starten inclusief verantwoordelijkheid en budget<sup>21</sup>. De focus van het programma zou met name moeten liggen op het creëren en waarborgen van een organisatiebrede basis (inclusief visie, spelregels en datalandschap) en kennisopbouw en -overdracht (3). Het traject en datamodel met betrekking tot datagedreven vastgoedsturing kan gezien worden als een concreet project (2) en toont de ambitie van de gemeente Groningen met betrekking tot datagedreven dienstverlening en werken.

Tegelijkertijd is het traject naar datagedreven vastgoedsturing niet afhankelijk van een organisatie-breed programma, de ontwikkeling binnen het Vastgoedbedrijf kan reeds worden ingezet. Het beschreven stappenplan zorgt ervoor dat we vertrouwd raken met het gebruik van data en informatietechnologieën en uiteindelijk komen tot een tool die *actionable insights* mogelijk maakt. Datagedreven sturen is een middel naar het hogere doel (maatschappelijk rendement). Prestaties kunnen worden geanalyseerd, belangen en doelstellingen integraal afgewogen en beleid gevormd. Het gebruik van data en informatietechnologieën creëert inzicht en vormt de basis voor het aangaan van de dialoog, het nemen van beslissingen en het opstellen van lange termijn doelen. 'Je wordt niet gestuurd door data, maar gedreven in je handelen' (VNG, 2018). Als bijvoorbeeld blijkt dat het vooraf opgestelde maatschappelijke doel niet behaald wordt en er is sprake van een negatief financieel rendement, moeten we dan het gebouw behouden? En als het maatschappelijke doel wel behaald wordt, maar er is sprake van een negatief financieel rendement, hoe grijpen we dan in? Of als we breder kijken; wordt een voorziening op de juiste locatie gepland oftewel vraagt (niet letterlijk) de stad of een wijk om dit vastgoed? En als we toekomstige trends en patronen voorzien, welke voorzieningen achten we noodzakelijk en hoe kunnen we daarop inspelen?

De weg naar datagedreven werken en sturen is er één van de lange adem. De eerste drie stappen vormen de basis, bij stap 4 wordt het uiteindelijke doel bereikt. Datagedreven vastgoedsturing is een andere manier van denken en doen en verloopt volgens een traject van experimenteren, checken en handelen (sturen). In figuur 3 is het traject voor wat betreft de eerste drie stappen uitgezet naar tijd. Voor het datamodel geldt dat begonnen wordt met het verbinden van de beschikbare data, onder andere financiële en onderhoudsdata. Dit inzicht levert al waardevolle informatie op omtrent financieel rendement en kansen en bedreigingen, leert ons (kritisch) om te gaan met data en biedt een kapstok voor doorontwikkeling. In een vervolgfase wordt de stap gemaakt naar datagedreven sturen. De uitkomst is een proactieve, wendbare, toekomstbestendige organisatie die op innovatieve wijze inspeelt op een veranderende omgeving en stuurt op een zo hoog mogelijk maatschappelijk rendement.

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<sup>21</sup> De gemeente Utrecht werkt bijvoorbeeld met een programmaleider, een budget van 2 miljoen euro per jaar en een bestuurlijke doelstelling van ten minste twee projecten op het gebied van datagedreven sturing per organisatiedeel. De gemeente Haarlem beschikt over een interne Chief Data Officer die verantwoordelijk is voor gemeente breed beleid en kaders op het gebied van gegevensmanagement.



*Figuur 4: Tijdspad datagedreven vastgoedsturing*

*Noot: Het artikel is mede tot stand gekomen door inzet van Paul Oortwijn, directeur Vastgoed gemeente Groningen.*

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#### **10.4. Easement as the element of monetization of real estate and insurance for infrastructural and energy investments**

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##### **10.4.1. Abstract:**

The element of easement in commercial investments, as well as in cases of infrastructure and energy investments, is an often an overlooked element that can accelerate the exploitation of land, buildings and/or or their individual parts. At the same time, there are several positive aspects pertaining to usage and implementation of easement, both for the owner of the real estate as well as for the potential investor, irrespective of whether the investor is a private or private legal entity. Easement can have a positive effect on the development of infrastructure and energy investments. In the case of energy facilities, easement may have a positive effect on the real estate valuation. Easement represents a solid element of insurance and/or collateral in cases of energy investments and can be perceived as a major reduction of business risk for both the owner of the property as well as for the investor. A specific joint venture case in renewable energy investment will be described, where the easement right was used as a key element for the realization of the project. On the basis of theoretical discussion and analysis of selected case and previous academic research, some guidelines for faster, more efficient and cheaper developments in the field of infrastructure and energy investments, will be provided.

**Keywords:** Easement, Energy investments, Infrastructure investments, Real estate planning and development

#### 10.4.2. Pravni vidiki služnosti

Element služnostne pravice je pri komercialnih investicijah, pa tudi v primerih infrastrukturnih ter energetskih investicij, večkrat spregledan element, ki lahko pospeši eksploatacijo zemljišč, gradbenih objektov ali njihovih posameznih delov. Obenem ima služnost lahko več pozitivnih aspektov, tako za lastnika nepremičnine, kot tudi potencialnega vlagatelja, ne glede na to ali je vlagatelj zasebna ali privatna pravna oseba. Stvarnopravni zakonik (v nadaljevanju: SPZ) (Ur. l. RS, št. 87/2002) v svojem 213. členu pojasnjuje, da je stvarna služnost pravica lastnika nepremičnine (gospodujoča stvar), izvrševati za njene potrebe določena dejanja na tuji nepremičnini (pozitivna služnost) ali zahtevati od lastnika služne stvari, da opušča določena dejanja, ki bi jih sicer imel pravico izvrševati na svoji nepremičnini (negativna služnost). Lahko je ustanovljena za določen čas ali za določen letni čas. V 214. členu pa navaja, da stvarna služnost nastane z zakonom, na podlagi pravnega posla ali z odločbo državnega organa. 215. člen pa navaja, da mora pogodba o ustanovitvi služnosti vsebovati ime lastnikov gospodujoče in služne nepremičnine, zemljiškoknjižno oznako obeh nepremičnin, natančen opis služnosti in morebitno nadomestilo, ki ga mora plačati lastnik gospodujoče nepremičnine. Nadomestilo se lahko določi v enkratnem znesku ali v periodično zapadlih obrokih. Lastnik služne stvari mora v izvrševanju oblasti nad svojo stvarjo nekaj trpeti, čeprav je izvrševanje vsebine služnosti omejeno samo na del služne nepremičnine (Juhart, 2003; Tratnik, 2010). 226. člen SPZ določa, da je neprava stvarna služnost tista, ki je po svoji vsebini stvarna služnost, se lahko ustanovi tudi v korist določene osebe. V teh primerih se glede nastanka in prenehanja uporabljajo določila tega zakona, ki urejajo osebne služnosti (SPZ, 227. člen):

(1) Osebna služnost je pravica imetnika, da uporablja tujo stvar, ali izkorišča pravico in traja najdlje do imetnikove smrti.

(2) Če je osebna služnost ustanovljena v korist pravne osebe, čas njenega trajanja ne sme biti daljši od trideset let (<http://www.uradni-list.si/1/objava.jsp?urlid=200287&stevilka=4360>, 07. 01. 2016).

Navedeno posega v področje stvarnega prava, prava nepremičnin, gospodarjenja z nepremičninami ter energetskih in infrastrukturnih investicij. Primer, katerega problematiko obravnavamo v pričujočem članku, so fotonapetostne (sončne) elektrarne (v nadaljevanju: FNE). Postavitev le-teh je v veliki večini na strehah stavb in drugih gradbenih objektov, v manjši meri so postavljene tudi na prostem. Glavni vir prihodkov teh FNE je proizvodnja električne energije, ki je s strani države subvencionirana s podporno shemo. Na tak način je določena odkupna cena električne energije, veljavnost teh pogodb je pa 15 let. Zato se (ponavadi) najemne, in vzporedno tudi služnostne, pogodbe podpisujejo za čas veljavnosti 15 let ter je ustanovitev ter vknjižba služnostne pravice v teh primerih izjemnega pomena.

Neprava stvarna služnost se vpisuje v zemljiško knjigo z vknjižbo. Vknjižba se dovoli na podlagi javne listine (npr. notarski zapis o ustanovitvi služnostne pravice) ali zasebne listine (pogodba o ustanovitvi služnosti, ki je primerna za vpis). Zasebna listina mora temeljiti na veljavnem pravnem temelju (v našem primeru sklenjena dolgoročna najemna pogodba) in mora vsebovati zemljiškoknjižno dovolilo, ki je opredeljeno kot izrecna nepogojna izjava tistega, čigar pravica se prenaša, spreminja, obremenjuje ali preneha, da dovoljuje vpis v zemljiško knjigo (Tratnik, Venčur, 2005).

Temeljno znanstveno vprašanje je, ali ima lahko taka služnostna pravica, ustanovljena in vpisana v zemljiško knjigo v ime tretje osebe, pozitiven učinek pri vrednotenju nepremičnine. Glede na velik delež neizkoriščenih nepremičnin in njihovih posameznih delov, predvsem streh, bi želeli podrobno preučiti možnosti razvoja trajnostnih energetskih investicij na področju obnovljivih virov energije.

Za ocenjevanje vrednosti stvarne služnosti je pomemben tudi 219. člen, ki pravi, da če je za izvrševanje stvarne služnosti potrebna uporaba kakšne naprave ali je potrebno kakšno dejanje, krije stroške vzdrževanje ali takega dejanja lastnik gospodujoče stvari. Če napravo uporablja tudi lastnik služne stvari ali je dejanje tudi v njegovem interesu, krijeta stroške vzdrževanja takšne naprave in stroške takega dejanja lastnik gospodujoče in lastnik služne stvari v sorazmerju s koristjo, ki jo imata. Neprava stvarna služnost pa je služnost, ki je po svoji vsebini stvarna služnost in se lahko ustanovi tudi v korist določene osebe (226. člen). Po SPZ poznamo: osebne služnosti, užitek, raba, služnost stanovanja, stvarno breme, stavbna pravica.

V članku torej raziskujemo sledečo problematiko:

Ali ima lahko služnostna pravica, ustanovljena na nepremičnine ali delu le-te v ime tretje osebe (pravne ali fizične), pozitiven učinek pri vrednotenju nepremičnine ?

Ali služnostna pravica predstavlja zelo dober element zavarovanja ter zmanjšanja poslovnega tveganja za vse deležnike, vpete v infrastrukturno ali energetske investicije ?

Kaj se zgodi v primerih izvršilnih postopkov, kjer predstavlja služnostna pravica bistveno boljše zavarovanje investicije, ki izhaja iz ustanovljene služnostne pravice, kot pa stavbna pravica ?

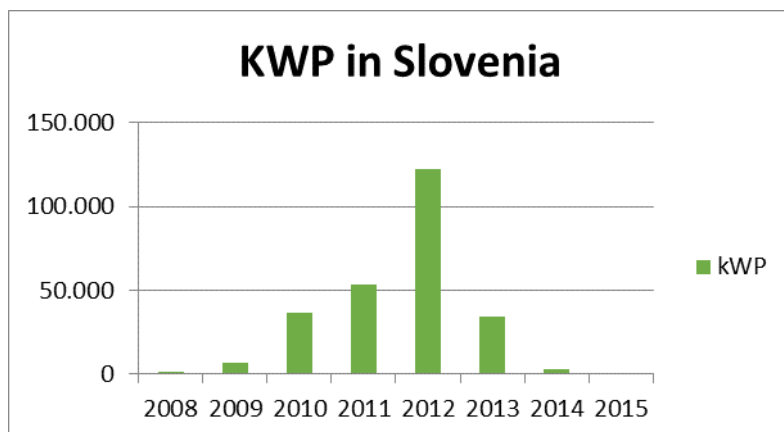
#### **10.4.3. Pravne osnove podporne sheme (subvencij) za obnovljive vire energije**

Večina držav članic EU za spodbujanje proizvodnje električne energije (v nadaljevanju: EE) iz obnovljivih virov energije (v nadaljevanju: OVE) in soproizvodnjo toplote in elektrike (v nadaljevanju: SPTE) uporablja feed-in sistem. Osnovni koncept feed-in sistemov je v vseh državah enak, tj. zagotavljanje vnaprej določene odkupne cene ali premije za proizvedeno električno energijo. Vsaka država je s feed-in sistemom spodbudila shemo spodbud, ki pa se v praksi med seboj lahko tudi precej razlikujejo. Razlike so predvsem v tehnologiji, ki jih spodbujajo, v višinah podpor in obdobju upravičenosti do podpore ter pri organiziranju sheme, pristojnosti za izvajanje sheme ter tudi pri financiranju sheme in načrtovanju.

Pravna osnova podporne sheme (subvencij) za obnovljive vire energije v Sloveniji je energetske zakon iz leta 2007 (Uradni list RS, št. 17/14 in 81/15). 13. člen tako pravi, da »ministrstvo, pristojno za energijo izvaja programe za spodbujanje učinkovite rabe energije in rabe obnovljivih virov energije« (<http://www.uradni-list.si/1/objava.jsp?sop=2007-01-1351>, 05. 02. 2016). 40. člen pravi, da »sistemski operaterji distribucijskih in prenosnih omrežij za električno energijo morajo vsakemu novemu proizvajalcu električne energije iz obnovljivih virov energije ali iz soproizvodnje, ki se želi priključiti na omrežje, zagotoviti celovito in podrobno oceno vseh stroškov priključitve« (<http://www.uradni-list.si/1/objava.jsp?sop=2007-01-1351>, 05. 02. 2016). 66. b člen določa, da se »dodatek za spodbujanje učinkovite rabe energije in izrabo obnovljivih virov energije v višini, kot jo določi vlada, plačuje od vsake porabljene kilovatne ure električne energije v Republiki Sloveniji« ter da »Vlada predpiše vrsto in obseg programov za spodbujanje učinkovite rabe energije in izrabo obnovljivih virov energije, ki se financirajo iz dodatka iz prvega odstavka« (<http://www.uradni-list.si/1/objava.jsp?sop=2007-01-1351>, 05. 02. 2016).

To podporno shemo je Republika Slovenija prijavila pri Evropski komisiji kot del strategije 20/20/20. Le-ta je skupek zavezujoče zakonodaje, ki pravi, da bi vse članice EU morale do leta 2020 pridobivati 20 % svoje električne energije iz obnovljivih virov energije ([http://ec.europa.eu/clima/policies/strategies/2020/index\\_en.htm](http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm), 06. 02. 2016). Tako je v Sloveniji vzpostavljen mehanizem, ki je iz prispevka za OVE, ki ga plačujejo vsa gospodinjstva ter gospodarski subjekti, začel financirati razvoj in vlaganja v OVE, v našem konkretnem primeru v FNE. Podporna shema za FNE v letu 2012 je bila zastavljena na način, da se po priključitvi FNE v distribucijsko omrežje ter pridobitve ustrezne deklaracije o proizvodni napravi podpiše pogodba z državnim podjetjem Borzen d. o. o. Le-ta lastniku FNE omogoča 15-letno finančno podporo v obliki subvencije za vsako proizvedeno kWh iz naslova FNE.

Graf 1: Inštalirana nazivna moč sončne elektrarne (v nadaljevanju: SE) v Sloveniji po letih



Vir: <http://pv.fe.uni-lj.si/SEvSLO.aspx>, 04. 02. 2016.

V grafu 1 je nazorno prikazana rast (do leta 2012) in takoj zatem tudi padec, ko se je podporna shema zmanjšala in na koncu praktično ukinila. Skupno je v Sloveniji torej inštaliranih SE skupne nazivne moči 257 MWp. Za primerjavo, Nuklearna Elektrarna v Krškem (NEK) ima moč na pragu 696 MWp in letno proizvede 5 milijard kWh, kar predstavlja 40 % vse v Sloveniji proizvedene električne energije. Blok 6 Termoelektrarne v Šoštanju (TEŠ 6) ima moč na pragu 600 MWp in naj bi letno proizvajal 3,5 milijarde kWh. Vse SE skupaj letno lahko proizvedejo okoli 260 milijonov kWh. Proizvodnja je seveda močno odvisna od ur sončnega obsevanja, tako da dejanske številke lahko nihajo. SE so trenutno dokaj nepomemben vir proizvodnje električne energije, je pa Republika Slovenija sledila EU uredbi in strategiji diverzifikacije proizvodnje EE.

Tabela 1 prikazuje višino finančnih podpor v letih od 2008 do 2015.

Tabela 1: Višino finančnih podpor v letih od 2008 do 2015

| Višina podpore v EUR/MWh                       | Na stavbah | Na tleh  |
|------------------------------------------------|------------|----------|
| Leto začetka delovanja                         |            |          |
| <b>2009</b>                                    |            |          |
| Micro (<50 kWp)                                | 415,46 €   | 390,42 € |
| Mini (< 1 MWp)                                 | 380,02 €   | 359,71 € |
| Medium (> 5 MWp)                               | 315,36 €   | 289,98 € |
| <b>2010 (-7%)</b>                              |            |          |
| Micro (<50 kWp)                                | 386,38 €   | 363,09 € |
| Mini (< 1 MWp)                                 | 353,42 €   | 334,53 € |
| Medium (> 5 MWp)                               | 293,28 €   | 269,68 € |
| <b>2011 (-20%)</b>                             |            |          |
| Micro (<50 kWp)                                | 332,37 €   | 312,34 € |
| Mini (< 1 MWp)                                 | 304,02 €   | 287,77 € |
| Medium (> 5 MWp)                               | 252,29 €   | 231,98 € |
| <b>2012 (do 30.6.) (-30%)</b>                  |            |          |
| Micro (<50 kWp)                                | 290,82 €   | 273,29 € |
| Mini (< 1 MWp)                                 | 266,01 €   | 251,80 € |
| Medium (> 5 MWp)                               | 220,75 €   | 202,99 € |
| <b>2012 (do 3.12.) (-40%)</b>                  |            |          |
| Micro (<50 kWp)                                | 249,28 €   | 234,25 € |
| Mini (< 1 MWp)                                 | 228,01 €   | 215,83 € |
| Medium (> 5 MWp)                               | 189,22 €   | 173,99 € |
| <b>2013 (od 1.1.) (-52,5%) NEW Govt. Order</b> |            |          |
| Micro (<50 kWp)                                | 197,34 €   | 185,45 € |
| Mini (< 1 MWp)                                 | 180,51 €   | 170,86 € |
| Medium (> 5 MWp)                               | 149,80 €   | 137,74 € |

Vir: <https://www.borzen.si>, 04. 02. 2016.



#### 10.4.4. Posebne okoliščine investicij v SE

Energetski objekti spadajo med t.i. dolgoročne investicije, so zelo podobni infrastrukturnim projektom. Imajo poudarjen dolgoročni vidik, nižje, a vendarle zanesljive donose ter nizko raven poslovnega tveganja. Značilnosti investicij v infrastrukturna osnovna sredstva so sledeče (Sawant, 2010):

- visoka in kapitalno intenzivna vlaganja na začetku, brez česar začetek povrnitve investicije
- sploh ni možen;
- stabilni, redni in večjim nihanjem nepodložni denarni tokovi;
- dolgoročna narava sredstev, investicije ter donosov;
- investicije v infrastrukturo so nepovratne, kar pomeni, da se jih povečini ne da enostavno odstraniti, oz. namestiti nekje drugje;
- so lokalno specifične, močno podvržene specifičnim lokalnim vplivom (političnim, ekonomskim, okolijskim, finančnim ...);
- imajo možnost rasti;
- imajo vidik ohranjanja vrednosti tudi v primerih stečajnih postopkov.

Poslovno tveganje je pa vedno povezano z zavarovanjem. Pri infrastrukturnih projektih gre za kombinacijo koncesije in/ali lastništva zemljišča kjer se infrastrukturni objekt nahaja. Pri FNE, predvsem tistih postavljenih na strehah raznih nepremičnin, stavb in ostalih objektov, je pa eden glavnih vidikov zmanjšanja poslovnega tveganja zavarovanje s t.i. ustanovitvijo služnostne pravice.

Ustanovitev služnostne pravice, skupaj z dolgoročno najemno pogodbo, ščiti investitorja oz. lastnika FNE pred poslovnimi tveganji, oz. le-ta znižuje na obvladljivo mero. V nadaljevanju nas zanima, kako ustanovitev služnosti, ter pravilen vpis le-te v zemljiško knjigo, predstavlja celovit element zavarovanja pred poslovnim tveganjem v večini potencialno nevarnih scenarijev.

Kot navaja Coyle (2001) se podjetja se načeloma srečujejo z dvema vrstama tveganj (Coyle, 2001):

- s poslovnim tveganjem – komercialne aktivnosti podjetja postanejo manj uspešne kot v preteklosti (kot je bilo predvideno) (npr. konkurenčno podjetje je uvedlo nov izdelek, kar ima za posledico upad prodaje);
- s finančnim tveganjem – je verjetno manj razumljeno; je tveganje, da so se finančne okoliščine tako spremenile, da lahko poslabšajo stanje podjetja. Finančne okoliščine se nanašajo na denar in dolgove, kot so stroški posojil, donosi investicij, razpoložljivost denarja na trgu in slabi dolgovi dolžnikov.

Namen ustanovitve služnosti je zavarovanje investitorja (v našem primeru nosilca služnostne pravice) pred finančnim tveganjem. Pred poslovnim tveganjem ga varuje podporna shema, ki mu zagotavlja subvencionirano odkupno ceno električne energije za obdobje 15 let. Podporna shema je del energetskega zakona. Stvarno pravni zakonik (Tratnik, 2010) služnost definira kot pravico uporabljati tujo stvar ali izkoriščati pravico oziroma zahtevati od lastnika stvari, da opušča določena dejanja, ki bi jih sicer imel pravico izvrševati na svoji stvari (služeča stvar).

#### 10.4.5. Služnost v praksi: primer

Pravna ali fizična oseba A ima v lasti določeno nepremičnino. Kot raziskovalni primer energetskega objekta FNE, predpostavimo, da je ta nepremičnina večje skladišče. Nepremičnina je vpisana v zemljiško knjigo z vsemi pripadajočimi podatki. Nepremičnina je bremen prosta, kar pomeni, da na nepremičnini v zemljiški knjigi ni vpisane nikakršne hipoteke ali drugih bremen.

Pravna ali fizična oseba B se je odločila za investicijo v FNE, za postavitev le-te pa ima prej omenjena nepremičnina (skladišče) zelo dobre pogoje. Oseba A in oseba B se dogovorita za dolgoročno najemno pogodbo. Predmet najema je streha oz. strešna površina omenjene nepremičnine. Obe osebi podpišeta dolgoročno najemno pogodbo, kjer so opredeljeni vsi ključni dejavniki (cena v €/m<sup>2</sup>, trajanje pogodbe, obveznosti in pravice najemodajalca ter najemjemalca, odpovedni rok, ipd...). Vendar pa se oseba B

zadeva, da je investicija v FNE dolgoročna. Prav tako so dolgoročni tudi donosi, tveganje je pa veliko. Zato oseba B predlaga ustanovitev služnosti na tej nepremičnini. Bistvo je, da se vsaka najemna pogodba lahko prekine, bodisi s strani najemodajalca, bodisi najemjemalca, služnost se pa v svojem trajanju ne more prekiniti. Služnost omogoča uporabo zemljišča ali druge nepremičnine, v našem primeru strehe omenjenega skladišča, za potrebe, ki so opredeljene v služnostni pogodbi. Oseba B tako postane služnostni upravičenec in uporablja streho za potrebe izgradnje, uporabe ter upravljanja svoje FNE. Služnostna pravica velja tudi (če je seveda tako dogovorjeno v služnostni pogodbi) za dostopne poti, požarne izhode, ipd.

Služnost je izjemnega pomena ne samo za osebo B, ampak tudi za lastnika nepremičnine, torej osebo A. Pomen za osebo B je jasen, zagotavlja namreč pravico uporabe strehe (in ostalih morebitnih t.i. podpornih površin) ne glede na mnoge scenarije, ki so v takem poslu možni. Po drugi strani je služnost prav tako pomemben vidik zavarovanja tudi za osebo A, torej lastnika. Služnostna pravica, namreč jasno in zelo natančno določa, v kakšne namene, na kakšen način ter v kakšnem časovnem obdobju lahko služnostni upravičenec uporablja del nepremičnine. Oseba A je še vedno lastnik celotne nepremičnine, z njo lahko prosto razpolaga (jo proda ali obremeni) in jo uporablja za svojo osnovno dejavnost. Lastnik objekta s tem seveda pridobi dvojno ekonomsko korist – dodaten zaslužek iz naslova najemnine za strešne površine ter zmanjšane stroške investicijskega vzdrževanja, saj načeloma lastnik FNE prevzame le-te.

Kot opisano v našem raziskovalnem primeru, so po navadi pri FNE na strešnih površinah okoliščine takšne, da lastnik FNE ni tudi lastnik strehe oz. objekta, na katerem FNE stoji. Glede na dolgoročnost investicije je potrebno z lastnikom objekta skleniti dolgoročno najemno pogodbo, ki lastniku FNE omogoča eksploatacijo FNE kot osnovnega sredstva oz. infrastrukturne investicije.. Lastnik FNE kot dodatno obliko zavarovanja investicije poleg najemne pogodbe uredi še sklenitev dodatne služnostne pogodbe ter vpis obeh v zemljiško knjigo. Posebnega plačila za služnostno pravico ni, saj je nadomestilo za najemnino opredeljeno že v najemni pogodbi, prav tako tudi modaliteta plačevanja le-tega.

Služnostno pravico moramo omeniti tudi še v ločenem vidiku. Oseba B, za potrebe izgradnje oz. postavitve FNE, lahko najame bančno posojilo. Banka lahko (in po navadi se za to v velikem številu primerov tudi odločijo) zahteva, da se kot služnostnega upravičenca v zemljiško knjigo vpiše prav njo. S tem dejanjem tudi sama banka dodatno zavaruje svoje posojilo. Služnostna pravica se v primerih postavitve in upravljanja FNE smatra kot prvovrstno zavarovanje.

Vendar pa našeta pravna dejstva ne opredeljuje nekaterih ostalih scenarijev, ki za osebo B (in/ali banki, ki je dala posojilo) predstavljajo dodatna tveganja. Pri preverjanju morebitnih tveganj, je eno izmed slovenskih podjetij, ki je vlagalo v FNE v Sloveniji, odkrilo možne scenarije, ki niso bili vnaprej nikjer opredeljeni.

Scenariji so lahko naslednji:

- Stečaj lastnika nepremičnine (v našem ilustracijskem primeru stečaj osebe A);
- V zemljiški knjigi je vpisana hipoteka v vrstnem redu pred služnostno pravico. Hipoteka je vknjižena v dobro tretje osebe. Tretja oseba/družba izvrši izvršbo na nepremičnino, kjer je vpisana služnost (v našem primeru – hipoteka v korist hipotekarnega upravičenca osebe C, je vpisana po vrstnem redu pred služnostno pravico upravičenca osebe B; oseba C izvrši izvršbo po Zakonu o izvršbi in zavarovanju nad nepremičnino v lasti osebe A);
- Nepremičnina, na kateri je hipoteka v vrstnem redu vknjižena pred služnostjo, je prodana v izvršilnem postopku (v našem primeru – oseba A izgubi lastništvo nad nepremičnino v izvršilnem postopku).

Vsi trije zgoraj naštetih scenariji postavljajo osebo B, kot investitorja oz. lastnika FNE, pred isto vprašanje – ali služnost v katerem koli od le-teh scenarijev ugasne oz. preneha veljati? Ali bi bila v primeru, da bi bila nepremičnina, na kateri je hipoteka vknjižena (časovno) pred nepravo stvarno služnostjo, prodana v izvršilnem postopku, hkrati izbrisana tudi služnost?

174. člen Zakona o izvršbi in zavarovanju (ZIZ), ki pravi, da stvarne služnosti na nepremičnini z njeno prodajo ne ugasnejo (Vovk, 2008). Na primer, Juhart (2012) ugotavlja naslednje:

»Prisilno prodajo nepremičnine urejajo določbe Zakona o izvršbi in zavarovanju (ZIZ). Pri tem ne gre le za procesne določbe, ki urejajo način prodaje, ampak imajo nekatere določbe ZIZ tudi materialno pravno naravo.... Pri prisilni prodaji nepremičnine ne gre za pravnoposlovno pridobitev nepremičnine, pač pa se lastninska pravica pridobiva na podlagi odločbe sklepa sodišča o izročitvi nepremičnine.... Razmerje med zastavno pravico na eni, ter služnostno pravico na drugi strani ureja 174. člen ZIZ.... Od zastavne pravice kasnejše pravice (\* v našem primeru služnosti vpisana po vrstnem redu za hipoteko) s prisilno prodajo ugasnejo in se izbrišejo iz zemljiške knjige... Poseban ureditev je pa v prvem odstavku 174. člena ZIZ določena za stvarno služnost, ki pa kot pravica ne ugasne, kar pomeni da učinkuje tudi proti kupcu iz prisilne prodaje....«

V tem odstavku ZIZ povsem jasno navaja, da gre za izjemo od prednostnega načela. Pri stvarnih služnostnih pravicah namreč ni pomemben vrstni red vpisa, ampak je stvarna služnost opredeljena kot močnejša pravica, ki kot taka učinkuje proti zastavnemu upniku (v našem primeru oseba C), katerega zastavna pravica ima sicer prednost po vrstnem redu.

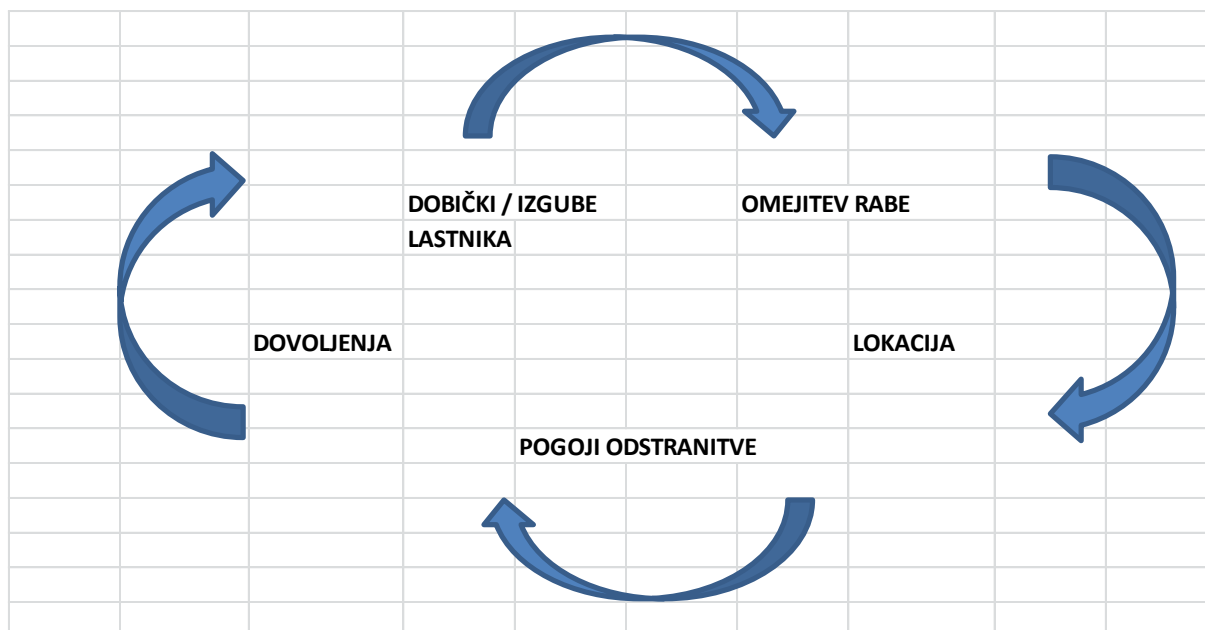
V prid zgoraj omenjenemu pravnemu mnenju govori tudi primer sodne prakse:

Okrajno sodišče v Kranju je dne 3.2.2012 izdalo Odredbo o prodaji nepremičnine v izvršilni zadevi upnika (opravilna številka IN 219/2008, okrajna sodnica Zofka Kadunc). V 6. točki omenjene odredbe je izrecno navedeno, da je na parcelni številki ene izmed parcel, ki se prodajajo na dražbi v izvršilnem postopku, vknjižena nepravna stvarna služnost – in sicer služnostna pravica gradnje, vzdrževanja, uporabe in dostopa do napeljav komunalnih vodov v korist drugega imetnika/upravičenca. Naprej je v tej isti točki navedeno, da omenjena pravica v korist drugega upravičenca ne ugasne. Tako se tudi s to sodno prakso potrjuje zgoraj navedeno mnenje Juharta (2012).

#### **10.4.6. Vrednotenje služnosti**

Pri vrednotenju se pojavlja vrsto vprašanj. Ena najpomembnejših stvari je, da ocenjevalec korektno identificira vse pravice na nepremičnini ter ugotovi, kako bo služnost vplivala na nadaljnjo uporabo nepremičnine. Pomembno je ugotoviti, kje bo služnost potekala ali bila locirana. Različne lokacije povzročajo različne obremenitve nepremičnine. Pomembno je definirati časovno omejitev služnosti (stala, začasna). Pomembno je ali se služnost lahko potem odstrani in s kolikšnimi stroški je to povezano. Ali lahko lastnik področje služnosti uporablja (prečka, vzdržuje, obnavlja, ipd..) ? Ali je to povezano z dovoljenju, pogodbenimi dogovori ? Vse navedeno lahko za lastnika pomeni izgubo ali dobiček vezano na ustanovitev služnosti. Šnajberk (2015) vse navedene pravice, ki so med seboj močno povezane, prikaže v krožnem diagramu (slika 2).

Slika 2: Identifikacija glavnih pravic v povezavi s služnostjo na nepremičnini



Identifikacija in medsebojna povezanost glavnih pravic s služnostjo na nepremičnini je zato ključnega pomena za vrednotenje le teh. V literaturi zasledimo vrsto pristopov k reševanju vrednostnega problema služnosti (Munneke in Trefzger, 1998; Žlajpah 2007; Šnajberk, 2015; Stopar in Šubič Kovač, 2016). Izhajamo iz teorija vrednotenja nepremičnin (Kleiber, 2010), ki obravnava vrednotenje stvarne služnosti z dveh vidikov, in sicer:

- stvarno služnost v smislu bremena obravnava kot neobičajno okoliščino oziroma pravno značilnost, ki vpliva na spremembo vrednosti ocenjevanega zemljišča,
- stvarno služnost obravnava zaradi določitve nadomestila samostojno kot predmet vrednotenja.

Kot navajata Uhlir in Majčica (2016) pa je pomembno razumeti, da se služnost običajno res izvršuje samo na delu nepremičnine, vendar pa to vpliva na celo nepremičnino. Po drugi strani pa vrednost pozitivne služnosti ni identična z vrednostjo negativne služnosti. Menimo pa, da bi primeru umeščanja infrastrukture za koriščenje obnovljivih virov energije (npr. sočne elektrarne), služnost morala biti določena na način, kot jo pravno tudi umeščamo med služnosti, torej kot stvarna služnost in kot nepravna stvarna služnost. Kot pravo stvarno služnost lahko v danem primeru razumemo identifikacijo in vrednotenje vseh pravic na nepremičnini oz. vplivov na te pravice v zvezi s tem kako bo služnost vplivala na nadaljnjo uporabo nepremičnine (npr. ali lahko lastnik uporablja površino nad/pod s služnostjo, ipd.), kje bo služnost locirana, obseg služnosti, časovna omejitev služnosti, stroški vzpostavitve in odstranitve služnosti, ipd.. Primer metodologije, ki obravnava služnost kot odškodnino zaradi motene uporabe nepremičnine kar obsega celotno obdobje od dneva nastanka do dneva prenehanja motenosti, predstavlja Žlajpah (2007). Podobno izhodišče zasledimo tudi v Pravilniku o metodologiji za določanje nadomestil za služnosti na vodnih in priobalnih zemljiščih v lasti Republike Slovenije (Ur.l.RS, št. 35/2011), ki določa metodologijo za določanje višine nadomestila za pridobitev služnosti na vodnih ali priobalnih zemljiščih v lasti Republike Slovenije in upravljanju ministrstva, pristojnega za vode, ki ga mora plačati služnostni upravičenec služnostnemu zavezancu za izvajanje posega, ki je predmet služnosti. Osnova za določitev nadomestila je temeljna vrednost služečega zemljišča z upoštevanjem površine vplivnega območja posega, vrste služečega zemljišča, vpliva posega na vodni režim, vpliva posega na služeče zemljišče, emisije v vode in trajanje služnosti. Višina nadomestila N je izražena v evrih in se določi po naslednji enačbi:

$$N = P(m2) \times TV \text{ (EUR/ m2)} \times F(\text{vrsta}) \times F(\text{režim}) \times F(\text{vpliv}) \times F(\text{emisija}) \times F(\text{čas})$$
pri čemer je:

|             |                                                                |
|-------------|----------------------------------------------------------------|
| P           | – površina vplivnega območja posega, izražena v m <sup>2</sup> |
| TV          | – temeljna tržna vrednost služečega zemljišča                  |
| F (vrsta)   | – faktor vrste služečega zemljišča                             |
| F (režim)   | – faktor vpliva posega na vodni režim                          |
| F (vpliv)   | – faktor vpliva posega na služeče zemljišče                    |
| F (emisija) | – faktor emisije v vode                                        |
| F (čas)     | – faktor trajanja služnosti.                                   |

Žlajpah (2007) izhaja iz parametrov, ki so prikazani tabelarično s spodnji tabeli:

| Odš = IzhVr * FObd * ( FObr * FDel * FTip )    |                                                                                                              |                    |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------|
| opis parametra                                 | razpon vrednosti                                                                                             |                    |
| IzhVr ... izhodiščna vrednost                  | določeno na podlagi ocene tržne vrednosti                                                                    |                    |
|                                                | trajno:                                                                                                      | Fobd = 1,00        |
|                                                | 99 let:                                                                                                      | Fobd = 1,00        |
|                                                | 1-99 let*:                                                                                                   | Fobd = 0,01 - 1,00 |
|                                                | *faktor ni linearno sorazmeren dolžini obdobja; upoštevati je potrebno tudi sedanjo vrednost bodočih donosov |                    |
| FObr ... vpliv stopnje obremenjenosti          | minimalna:                                                                                                   | FObr = 0,00 - 0,10 |
|                                                | srednja:                                                                                                     | FObr = 0,10 - 0,40 |
|                                                | velika:                                                                                                      | FObr = 0,40 - 0,90 |
| FDel ... delež obremenjenega dela nepremičnine | FDel = 0,00 - 1,00                                                                                           |                    |
| FTip ... tip objekta                           | individualni stanovanjski:                                                                                   | FTip = 0,90 - 1,10 |
|                                                | več stanovanjski:                                                                                            | FTip = 0,70 - 1,00 |
|                                                | poslovni:                                                                                                    | FTip = 0,60 - 1,00 |
|                                                | industrijski:                                                                                                | FTip = 0,30 - 0,70 |
|                                                | kmetijski:                                                                                                   | FTip = 0,40 - 0,80 |
|                                                | pomožni:                                                                                                     | FTip = 0,20 - 0,60 |

vir: Žlajpah, D.: Primeri izračun nadomestila zaradi služnosti. Združenje SICGRAS, Stavbe in služnostne pravice, Zbornik seminarja, Dobrovo v Goriških Brdih, 2007.

pri čemer je:

|       |                                                                           |
|-------|---------------------------------------------------------------------------|
| Odš   | – višina nadomestila oz. odškodnina zaradi vzpostavitve stvarne služnosti |
| IzhVr | – izhodiščna vrednost s služnostjo neobremenjenega zemljišča              |
| FObr  | – vpliv stopnje obremenjenosti zemljišča                                  |
| FDel  | – vpliv obremenjenega dela zemljišča                                      |
| FTip  | – tip objekta (ali namembnost zemljišča, če le to ni pozidano)            |

Tako npr. Pšunder (2007) podaja metodo izračuna vrednoti služnostne pravice, ki temelji na primerjavi sedanjih vrednosti bodočih plačil nadomestil za vzpostavitev služnostne pravice za nedoločen oziroma določen čas. Predpostavka pri temu modelu je, da poznamo višino nadomestila za služnostno pravico, vzpostavljeno za nedoločen čas. Pšunder (2007) navaja, da lahko povezavo med vrednostjo in bodočimi stanovitnimi plačili prikažemo s pomočjo vsote neskončne geometrijske vrste oziroma s pomočjo formule direktne kapitalizacije:

$$V_0 = \frac{PMT}{r}$$

pri čemer je:

$V_0$  - višina zmanjšanja vrednosti za vzpostavitev služnosti za nedoločen čas  
 $PMT$  - stanovitno plačilo  
 $r$  - zahtevana donosnost

Pri vzpostavitvi služnostne pravice lahko kot plačilo štejemo kakršnokoli obliko – tako denarno kot tudi nedenarno obliko koristi, ki jo pridobi lastnik nepremičnine na katerem bo vzpostavljena služnostna pravica. Kot smo napovedali uporabimo za prikaz odnosa med vrednostjo in bodočimi denarnimi tokovi enačbo, ki temelji na vsoti geometrijske vrste. V primeru izračuna višine nadomestila za vzpostavitev služnostne pravice za določen čas uporabimo tudi vsoto končne geometrijske vrste:

$$V_n = \frac{(1+r)^n - 1}{r * (1+r)^n} * PMT_0$$

$$V_n = YP_n * PMT =$$

pri čemer je:

$V_n$  - višina zmanjšanja vrednosti za vzpostavitev služnosti za n časovnih obdobj  
 $PMT$  - stanovitno plačilo  
 $r$  - zahtevana donosnost  
 $YP_n$  - množitelj stanovitnih plačil za n obdobj  
 $n$  - število obdobj

Če enačbo vsote neskončne geometrijske vrste preoblikujemo tako, da izpostavimo stanovitno plačilo  $PMT$  dobimo enačbo:

$$PMT = V_0 * r$$

ki jo vstavimo v enačbo končne geometrijske vrste, okrajšamo  $r$  in dobimo:

$$V_n = \frac{(1+r)^n - 1}{(1+r)^n} * V_0$$

Ta enačba predstavlja izračun zmanjšanja vrednosti nepremičninskih pravic zaradi vzpostavitve služnostne pravice za določen čas, če poznamo zmanjšanje vrednosti nepremičninskih pravic za vzpostavitev služnostne pravice za nedoločen čas.

*Tako neprava stvarna služnost lahko pomeni rabo služne nepremičnine. Vrednotenje neprave služnosti, izhajajoč iz zgoraj navedene metodologije, v praksi simplificirano nakazuje spodnji primer iz prakse:*

| Primer izračuna donosa   |     |                |
|--------------------------|-----|----------------|
| Nazivna moč              | 100 | kWp            |
| Modul                    | 250 | W              |
| Število modulov          | 400 |                |
| Površina modula          | 1,6 | m <sup>2</sup> |
| Neto površina elektrarne | 640 | m <sup>2</sup> |

|                                             |                |                |
|---------------------------------------------|----------------|----------------|
| Bruto površina elektrarne                   | 900            | m <sup>2</sup> |
| Število sončnih ur                          | 1100           | h              |
| <b>Proizvedena energija</b>                 | <b>110.000</b> | <b>kWh</b>     |
| Subvencionirana cena el. en.                | 0,266          | €/kWh          |
| <b>Letni prihodek</b>                       | <b>29.260</b>  | <b>€</b>       |
| Prihodek služnosti (%)                      | 8              | %              |
| Prihodek služnosti (€)                      | 2.341          | €              |
| <b>Prihodek služnosti (€/m<sup>2</sup>)</b> | <b>2,60</b>    | <b>€</b>       |

V zgornjem primeru smo za potrebe izračuna vzeli majhno SE vršne moči 100 kWh, ki je bila priključena na omrežje v letu 2012, od tudi takrat uporabljena subvencionirana odkupna cena v znesku 266 €/MWh, oz. 0,266€/kWh. Vzeli smo povprečno moč modulov (danes so v uporabi že zmogljivejši), kot tudi njihovo standardno velikost. Za število sončnih ur smo uporabili dolgoletno povprečje za Slovenijo, ki ga večinoma upoštevajo banke, pri svojih izračunih za tveganja. 8% donosa, je bila v letih 2011 – 2013, nekje srednja vrednost pričakovanih donosov, ki so jih zahtevali lastniki streh in ki so jih najemniki streh slednjim izplačevali (6 – 10%).

Na tak način pridemo do relativnega letnega zneska 2,60€/bruto m<sup>2</sup> površine SE, kar predstavlja letni donos iz naslova podeljene služnostne pravice.

Nepravna stvarna služnost torej sloni na izračunu pripadajočega prihodka, kar lahko pomeni, da ima služnostna pravica, ustanovljena na nepremičnini ali delu le-te, pozitiven učinek pri vrednotenju nepremičnine, saj kot taka donosa donos, ki kapitaliziran vpliva na vrednost nepremičnine.

#### 10.4.7. Sklep

Pri energetskih projektih, kot tudi pri vseh ostalih infrastrukturnih projektih ali »green field« vlaganjih, je eden ključnih dejavnikov za uspeh, tako poslovni kot tudi finančni, obvladovanje tveganj. Pri obvladovanju tveganj gre velikokrat za razne oblike zavarovanj, ki se lahko kažejo v raznih oblikah finančnih zavarovanj (menice, bančne garancije, bančni depoziti), podeljenih koncesijskih pogodb (garantirani prihodki), podpornih shem (predvsem pri obnovljivih virih energije) ali pa raznih zastav (zastave lastniških deležev v podjetjih, zastave delnic ali obveznic, zastave nepremičnin, zastave avtorskih pravic na intelektualni lastnini).

Raziskava kaže, da je služnostna pravica izredno učinkovita oblika zavarovanja, kar posebej velja prav pri energetskih projektih. Ustanovitev in vknjižba v zemljiško knjigo le-te je izredno dobra oblika zavarovanja za oba deležnika, tako lastnika nepremičnine kot tudi najemjemalca.

Lastnika nepremičnine služnostna pravica ne omejuje pri razpolaganju z nepremičnino ali obremenitvijo le-te. Obenem mu, vsaj v večini primerov, prinaša dodaten prihodek iz naslova najemne pogodbe, ki po navadi spremlja služnostno, kar pomeni, da ima lahko služnostna pravica, ustanovljena na nepremičnini ali delu le-te pozitiven učinek pri vrednotenju nepremičnine, saj kot taka donosa donos, ki kapitaliziran vpliva na vrednost nepremičnine.

Najemjemalcu, v primeru ko pa ta najema bančno posojilo, omogoča dolgoročno zavarovanje njegove investicije in s tem tudi dolgoročno zanesljivo pridobivanje stalnih prihodkov, brez skrbi, da lahko pride do prenehanja najemne pogodbe, ali zviševanja najemnih, ali z najemom nepremičnine, povezanih stroškov. Kar je izredno pomembno, predvsem iz vidika zavarovanja, je dejstvo, da vrstni red vpisa služnostne pravice

v zemljiško knjigo ne vpliva na to, ali le-ta lahko preneha/ugasne ali ne. Ne glede na to, da je pred vpisano služnostno pravico vpisana hipoteka ali kakšne druga oblika zastav nepremičnine, služnostna pravica, v primeru prodaje nepremičnine v izvršilnem postopku, ne ugasne oz. s samim zasegom oz. prenosom lastništva na preneha.

Raziskava torej potrjuje, da je zato vpisa služnostne pravice eden boljših inštrumentov zavarovanja pri dolgoročni izvedbi energetskih projektov.

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## 10.5. The Human Context in the Design of Architectures

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### 10.5.1. Abstract

Current developments in design, construction and engineering make it possible to design and construct buildings in a factory like manner. They can lead to the rigorous application of rationality. This feeds the debate on whether this can lead to sustainable livable spaces, because rationality only focuses on the functionality of a building. In that approach, that began at the beginning of the 20<sup>th</sup> century, the design of a building results from the intended use. The criticism of this approach is that it leads to structures that feel like and look like machines. It does not meet the requirement of Vitruvius ( $\pm$  85 - 20 B.C.), the first known architect who published a design approach on architecture, that the realization of both practical and symbolic requirements in a building are basic characteristics of architecture. More than 2000 years later, architecture can still be regarded as a powerful instrument to enforce cultural, social and societal values. This position on architecture places great emphasis on the architect's social responsibility. It emphasizes that enforcing social and cultural values are functions of architecture and should always be considered in the design phase. In the debate on creating livable spaces the question is raised whether an approach, that can be described as 'design for people' or 'living architecture', is an economically feasible and realistic alternative to a pure rationalist design approach. Design principles and case studies in design literature suggest that it can. They support this design approach that focus on understanding the relationship between people, buildings and cities. However, there is one caution. From social theory it is known that fundamental differences exist regarding the philosophical position one can take on this design debate. Each stands in its own right and generates its own distinctive design approach. This difference is so fundamental that it makes the debate between practitioners of these different design approaches pointless. But that does not detract from the research findings that the 'living architecture' design approach has demonstrated valuable results and research is needed to determine how modern technologies can support that approach.

**Keywords:** Livable spaces, Rationalism, Subjectivism, Living architecture, Design for people, Fundamental differences in design approaches

### 10.5.2. Introduction

Rationality and the undervaluation of cultural, social and societal values in rational architectures emerged when new building materials entered the market and major shifts took place in philosophy and society (Roth 2007: 465). A design method to achieve rational designs based on the formulation of requirements of a functional program is published by Durand in 1802 in his 'Précis de leçons'. The role of rationality in the design of architecture was emphasized by architects such as Le Corbusier and Frank Lloyd Wright, and Viollet-le-Duc. Viollet-le-Duc is considered to be the first architect to describe a complete rationalist design method free of regulations and conventions from the past (Hearn 2003: 189). Viollet-le-Duc emphasized the rational role of the architect in the creation of physical structures. According to Hearn, this marked the beginning of the movement in which architects create highly structured and ordered buildings in which the function of the building the primary focus is. It led to the functionalistic architectural style of which Louis Sullivan is often regarded to be the creator in 1924. He used the phrase "form ever follows function" (Sullivan 1896). In his view, the natural law is that the design should always be driven solely by the function of the building.

A new design style was created at the beginning of the 21st century. In this style, architects went against the concept of the form fitting function and the concept that the context of a structure should be considered in the design. Disunity, ambiguity and contradiction was favored (McAuley et al. 2007: 200). Watkin and Zukowsky state: "With their individualistic angular spatial compositions of dynamic juxtaposition of forms in buildings they try to make chaos theory tangible" (Watkin and Zukowsky 2010). This new style in combination with the international 'celebrity system' resulted, according to Watkin and Zukowsky, in superstar architects who made their individual, egocentric, and unique marks all over the world. This was supported by new developments in design, like CAD and 3D modelling and new materials, like 3D printed components. These technologies have also led to a new trend in design and construction: industrialized construction. This design and construction method is based, among other things, on pre-fabrication of components at the factory, standardization of components and optimization of the planning and production process in terms of automation and mechanization (Girmscheid 2005). It relies heavily on standardization, systematization, flexibilization and rationalization of design and construction processes. The design in this method is based on highly standardized large and small building modules that can be prefabricated in a factory and assembled on the construction site, as if they were Lego blocks. This way of designing and building is fueled by the need for new houses and associated higher productivity requirements for the construction sector (ANP 2018).

The critics, introduced in the next section of this article, argue that because of this focus on functionality the so-called 'rational' architects and those new developments in design and construction ignore the social and cultural aspects and the symbolic expressiveness of architecture. Their claim is that these architects pay so much attention to the function and purpose that their architectures feel and look like machines.

The purpose of this exploratory and qualitative research is to examine and understand this criticism from a design perspective, to examine the current state of affairs with regard to design approaches that are not considered rational and to derive core elements from those approaches that can be applied in current design and construction practice to prevent a dominant focus on the function and purpose of a construction.

### 10.5.3. Criticism of rational design methods

The criticism of rational designs appeared in about the same time frame as criticism of rationality in society and organizational design in which the technical system becomes the focal point and the social system is subsequently developed around it (Clegg 2000). The resistance to this type of design was that the focus on rationality can repress the critically rational individual in the interest of a machine-like system of social functionality (Cooper 1989). Cooper feared that this type of design leads to a suppression of individual aspirations and force individual actions to be compatible with the overall goals of an impersonal system. Cooper and Burrell describe how that can lead to passive, reactive and negative concepts such as utility, adaptation and regulation that become major motifs in organizations and society (Cooper and Burrell 1988).

According to them, it bends to the mechanization of the social world. According to Pugh, Hickson et al., this criticism can be formulated as: "Although people are necessary for an organization to function at all, their presence gets in the way of its rationally efficient functioning" (Pugh et al. 1963). Pugh characterizes organization theorists that emphasize rationality and bureaucracy as theorists that are concerned about "organizations without people". He states that the opposite group is mainly concerned about informal group behavior and attitudes. Pugh characterizes these theorists as a group that is concerned about "people without organizations". Pugh states that accurate behavior can only be predicted when social factors within the primary social group are considered, as well as economic and social factors and the technical system.

In a famous open letter 'Dear architects, I am sick of your shit' Anne Choi described in 2007 her disgust with superstar and rational architects and their individual, egocentric, and unique marks all over the world (Choi 2007). Esherick wrote: "Beauty is a consequential thing, a product of solving problems correctly. It is unreal as a goal. Preoccupation with aesthetics leads to arbitrary design, to buildings which take a certain form because the designer likes the way it looks". To him no successful architecture can be formulated on a generalized system of aesthetics (Esherick 1966). Silber also criticizes these kinds of architecture who ignores the needs, values and beliefs of hundreds of thousands of people in implementing a plan that the architect believes is more reality than his fellow man (Silber 2007: 44). He refers to this kind of architecture as "architecture of the absurd". Other important critics are Jane Jacobs (1993) and Christopher Alexander (1965). Jane Jacobs contends that a building is not a set of walls and a city is not a set of buildings that can be designed purely by function alone. She defined a city as an ecosystem, in which physical, economic, and ethical processes are active and in which diversity is essential for survival (Jacobs 1993: xvi). Her main point was that rational city planning activities are so driven by functionalities that they alienated people from their neighborhoods. According to her, this kind of planning practice can only lead to decay because people miss a sense of belonging and ownership. To illustrate her contention, she referred to housing projects that failed because of a unilateral emphasis on functionality and rationality. Roth and Rainwater both provide substantiation for this argument by citing critics, such as Charles Jencks, who claimed that the pure logical determinism in modern architecture died at 3:32 P.M. on July 15 in 1972 when the demolition started of the federally built Pruitt-Igoe housing complex in St Louis Missouri (Rainwater 1970; Roth 2007: 560). They explained that the demolition was unavoidable since the residents of the complex had vandalized the complex. The complex expressed the highest ideal of functionalist architecture. In reality the design facilitated crime and the impoverished residents intended for it refused to live in it. To them it proved that social engineering is not possible. Christopher Alexander summarized his critique on highly rational designs in an article called 'A city is not a tree' (Alexander 1965). In this article he argued that designers, incapable of grasping the complex essence of a living city in a single design effort, create artificial structures by dividing the complex city entity into non overlapping units and subunits that only relate to each other in a treelike structure. Alexander argued that those architects create rational structures with unnatural divisions and lifeless subdivisions because they do not consider the natural way of living. Resistance to the rational architecture came also from a group called Team 10. They committed themselves between 1953 and 1983 to the return to the human dimension in architecture. They were fiercely opposed to the technological approach to architecture and the incoherent way in which buildings were erected in cities (Visscher 2005). Huxtable, an American architecture critic and writer, summarizes her critique as "the reinvention of the environment as themed entertainment" instead of "a balance of structural science and aesthetic expression for the satisfaction of needs that go far beyond the utilitarian" (Huxtable 1992). Critique on rational designs can also be found in the Netherlands in so called 'Vinex-wijken'. These suburbs were created after 1993 as a solution to the housing problem for a growing population and are situated alongside major cities. A major newspaper in The Netherlands, published an article on 21 February 2011 about issues in these suburbs (Algemeen Dagblad 2011). Its main message was that in the design of those areas not enough attention had been paid to the integration of work, living and leisure. The warning was that these areas could become ghettos because of that lack of integration and the insufficient attention to the needs and wants of elderly and young people. The article contended that young people got bored, and that this had already led to vandalism, burglary and threats.

#### 10.5.4. Architecture as a rhetoric device

These critics of pure rational architectures point to the absence of symbolic expression in the design. They state that architecture is more than just a building that can be utilized for some human activity. They claim that architecture is able to express some feeling. To them, this symbolic expression of values, besides the practical needs of architecture, is a need of people that started from the moment that civilizations started making physical structures. According to Vitruvius, the realization of both practical and symbolic requirements in a building are two basic characteristics of architecture (Vitruvius, English translation: 10-12). He is the first known architect who published in the Ten books on architecture (+ 20 BC) a complete design approach on architecture (Vitruvius, English translation 2005). According to him, architecture has three qualities: "firmitas", "utilitas" and "venustas". Meaning that a physical building must be durable, useful and beautiful. In 1543 Henry Wotton translated these properties in "commodity", "firmness" and "delight" (Wotton 1624).

In about 1450, the Italian architect Leon Batista Alberti described beauty of architecture in his treatise 'De re aedificatoria' (On Building) as: "Beauty is that reasoned harmony of all the parts within a body, so that nothing can be added, taken away or altered, but for the worse" (Alberti 1988). It is this attention to symbolic expression that the critics of rational designs lack in purely rational designs. Roger Scruton puts it like this: "the parts of a building seem to be fitted together in such a way that the meaningfulness of the whole will reflect and depend upon the manner of combination of its parts" (Scruton 1980a, p. 160). Roth regards architecture as a form of expressive art that cannot be separated from practical requirements (Roth 2007: 6). As Zevi puts it: "The essence of architecture does not lie in the material limitations placed on special freedom, but on the way space is organized into meaningful form through this process of limitation the obstructions which determine the perimeter of possible vision, rather than the 'void' in which this vision is given play" (Zevi et al. 1957).

According to Alexander, architecture is and must be an art of making (Alexander et al. 2012, p. 7) Instead of beauty, he uses the term wholeness. He stressed the importance of the interaction between people, the natural and physical environment to make architecture whole. He said "All space and matter, organic or inorganic, have some degree of life, and that matter/space is more alive or less alive according to its structure and arrangement" (Alexander 2003 p. 7). Panofsky states that architecture aspires "totality", "articulation" and "coherence" (Panofsky 1976). According to him, totality means that the building should fit within the physical location and the surrounding structures or nature surrounding it. As an example he states that in the creation of Gothic cathedrals architecture involves integration of theology, morality, nature and history in the plan. According to Roth, the purpose of architecture is to fulfill both practical and expressive requirements. He defines architecture as "the crystallization of ideas and a form of dialogue with the past and future". This reference to dialogue is present in the translation of the Latin term *ratio* that was used by Vitruvius and refers to methodically and logically reasoning. In this regard, Roth states that a physical building can be seen as a rhetorical device, which is reasoning with oneself by making a statement, then questioning that statement, then answering that question (Roth 2007: 5-6).

#### 10.5.5. Architecture's ability to enforce, stimulate and influence values

The achievement to express cultural, social and societal values through architecture, such as Egyptian civilization did through the pyramids in Gizeh and the temples of Karnak, has made civilizations famous. In ancient Egyptian society the geometric form was an expression of continuity and order. Egyptians saw not the stone, but the symbol (Smith 1938: 249). Other examples of the expressiveness of values in architecture are the temples of Greece whose order and regularity symbolized the ancient Greek belief in universal geometrical laws (Rieser 1956). In the medieval society of Europe, the functions and geometry of the Gothic churches were integrated in such a way that architecture was an attempt to create both a literal image of heaven and an instrument to express Catholic values (Simson 1956: 13). As Samuel Taylor Coleridge put it: "The principle of the Gothic architecture is infinity made imaginable" (Coleridge 1836: 240). Other examples of the power of architecture to express societal values are the Petronas towers in Kuala Lumpur, Malaysia and the One World Trade Center in New York. The Petronas towers have become symbols of corporate

power and a signature of Malaysia that announces its participation in the global economy (Ford 1998). The One World Trade Center in New York expresses freedom, resilience and power of the American people.

Because of this expressiveness of architecture and its prominent presence in society, the critics of pure rational architectures claim that architecture is not just about functionalities, but also about social values as well as environmental, political and economic values. According to Henri Lefebvre, architecture is the production of space (Lefebvre 1991a: 155). He argues that changing society and the production of space go hand in hand and that there is always a relation between places and their time. According to him, each timeframe has its own characteristics that are reflected in architecture and urban design. With each timeframe the relational networks and centers of communication in urban space change. Each moment in time has specific principles, or dominating factors, that organize and shape relational networks and centers of communication in spaces. For example, in the middle ages the dominating powers were those of aristocracy and the church. This can still be witnessed today in the structure of towns that have been built around cathedrals and palaces. In the industrial age power was formed by capital and politics. Cities were designed around the owners of production facilities. In recent years, dominant factors were the financial power and the public authorities, as can currently be deduced from the presence of dominant buildings of financial and governmental organizations in city centers, such as The Hague in the Netherlands.

This symbolic power implies that architecture influences the public, either consciously by its function and structure, or unconsciously in the feelings, norms and values that architecture symbolizes. Consequently, architecture can be a powerful instrument to enforce, stimulate and influence cultural and societal values and social life. Lefebvre contends that the Soviet constructivists of 1920-30 should have created a new space to support their new vision on society (Lefebvre 1991a: 59). That space should have represented the new symbols and representations of their movement. He states that without these new symbols and representations people in cities were constantly reminded and influenced by the culture of the past. This mechanism is also visible in a famous quote from Churchill in 1943 during a discussion in October 1943 on rebuilding the Commons Chamber. He said "we shape our buildings and afterwards our buildings shape us" (Anonymous 2018). He meant that in his belief the adversarial rectangular pattern of the chamber was responsible for the two-party system of British parliamentary democracy and therefore that shape should continue to exist. This put a huge responsibility on the architect of the Chamber, Giles Gilbert Scott.

#### **10.5.6. The architect's social responsibility**

These examples of Lefebvre and Churchill illustrate the social responsibility that an architect has according to the critics of the rational design method. This responsibility was emphasized by John Ruskin, a well-known critic of art and architecture, who stated that architects are agents of social improvement through good design (Hearn 2003: 13). As Scruton puts it: "the building has not only a relationship to the builder but also to the man who lives with it. The building becomes an objective part of a process of interaction with the world. Every man has a need to see the world around him in terms of the wider remnants of his rational nature; if he cannot do so he must stand towards it in an alienated relation, a relation based on the sense that the public order resists the meaning with which his own activity seeks to fill it" (Scruton 1980b). According to Alexander, an architect should contribute to "the comfort of belonging to the places where we live and work" (Alexander 2005: 66).

Scruton states that architecture transcends beyond the functional aspects and the consideration and incorporation of these different aspects is what distinguishes an architect from an engineer (1980a: 263). The engineer is responsible for building, construction. It is the role of the architect to decide what makes a church a church (Maier et al. 2001). At an abstract level the architect's problem is to mold and organize space in such a way that an optimum is found for executing a building's function without losing sight of aesthetic values (Scruton 1980a: 223). According to Vitruvius, it is the architect's role to focus on the function of a building and the correct application of the principles of order, eurhythmy, symmetry, propriety and economy. To achieve that, an architect should have thorough theoretical and practical knowledge of drawing, geometry, optics, economics, history, physics, philosophy, music, medicine and astronomy (Vitruvius, English translation 2005: 4-10).

This responsibility and role of the architect imply, according to the critics of pure rational architectures, that the effect that the physical structure has on its users and others that are directly and indirectly influenced by it must also be considered and understood during the design phase.

#### 10.5.7. Design approaches for people

Since architecture can be regarded as a powerful tool to express intangible values, the focus of a design approach for people should be on the creation of responsive and livable spaces that are comfortable and foster a sense of attachment and belonging. This is a result of the respect that the architect has for the practical, emotional, spiritual and cultural needs of the users of a building (Pontikis 2016).

A first example of such a design approach is the architectural design education of École des Beaux-Arts, a famous institution that was founded in 1671 in France. The basic principles of architectural design they taught were inspired on Vitruvius' principles and captured not only functionality, but also symbolic expression (Roth 2007: 501):

1. Understand the function of the structure and accommodate it;
2. Understand the nature of the building site, the prevailing climate and design the building in relation to that context;
3. Do not rely on complicated and costly designs. A good design is easily buildable;
4. Maintain truth in architectural expression;
5. A building must be structurally sound and look strong;
6. A building has easy and inevitable patterns of circulation, for admitting light and carrying off rainwater;
7. The buildings composition is good, beautiful, useful and has character.

The relationship between people, buildings and cities is not evident. In 1966 Hall proposed that team research is necessary to gain understanding of the relation between people, buildings and cities (E. Hall 1982: 181-189). In the book 'The Fourth Dimension In Architecture' Hall and Hall described their study of the design of the Eero Saarinen's building for Deere & Company (M. R. Hall and Hall 1975). They regarded this building as a classic example of a design for people. In their study they interpreted design for people as meaning integrating three interrelated factors that are also presented in Figure 1:

1. The structure itself, its program, design, workmanship, materials, detailing, etc.;
2. The people as physiological and psychological organisms who perform the functions the structure was designed for;
3. The organization that is also housed by the building, but which exists in a larger context. The organization and its structure become the content of a statement that can only be read in terms of its setting.

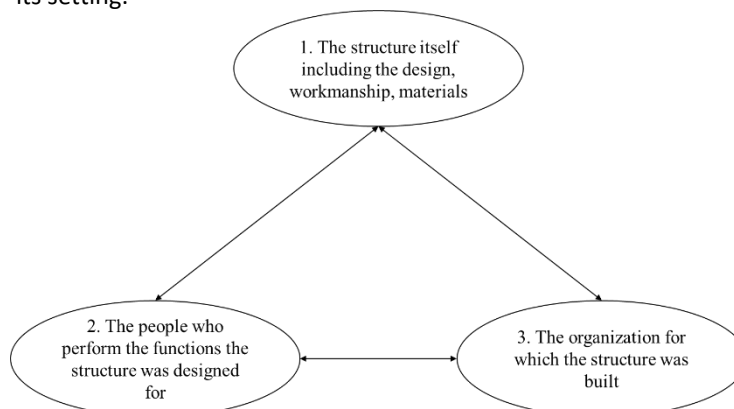


Figure 5: Interrelating factors in a design for people

They argued that in a design for people the structure, its purpose at the macro level and the human context should all be in alignment. Meaning that the environment the building provides is suitable for employees and teams, and inspires high quality, durability and strength in a manner that suits the organization's mission and reflects the industry the organization belongs to. They discovered three success factors: 1) The building provides a suitable environment for individuals and teams; 2) A high quality, durability and strong design; 3) The expression of the values of both the organization and the entire industry.

Hearn argued that in order to properly address cultural aspects in designs, architects need to incorporate the urban context in their designs and need to consider physical structures and cities as vitally important to organizations and society. He suggested a design approach in which all sorts of cultural values, meaning and symbolic purposes of the building are considered in the preliminary stage of a design, even before the start of the functional program to focus attention on cultural and symbolic meaning in architecture (Hearn 2003: 323-325). In this stage, the cultural context must be clearly defined in close consultation with the client and users. All social, political and cultural implications should be considered. According to him, it must be clear what values the building should communicate with reference to an already existing context.

Another approach for the design for people comes from Henri Lefebvre. He demonstrated how social values and architecture can influence each other and how architecture can support social values and effect peoples life. In his design approach he uses three concepts to characterize space in order to understand and create the relationship between architecture, urbanization, culture and society (Lefebvre 1991a: 33). He argues that time, or history, should also be accounted for in designs and the analysis of space because time creates physical, social and mental objects that influence relationships and objects. The concepts Lefebvre uses in his approach are (Lefebvre 1991c):

1. The physical form or real space as it is generated and used. Examples are spaces for travelling, work and leisure;
2. The mental construct or the representation of space. The information is conveyed by images and signs. It is the space for scientists, planners, urbanists. Examples are maps and plans, transport and communication systems;
3. Social space or representational space with symbolism and meaning, as produced and modified over time and through its use. It overlays physical space and makes symbolic use of its objects that can change over time.

Lefebvre uses a grid with three levels to analyze and design social spaces. He uses the levels G-global for the space with the broadest extension such as temples, palaces, political and administrative places, P-personal for the level of residences such as houses and apartments. The level between G and P he uses the M-intermediate level for intermediate spaces for arteries, transitional areas and places of business. Each of these levels again has the G-M-P hierarchy. (Lefebvre 1991b). Within these spaces Lefebvre identifies accessible space for normal use, boundaries and forbidden territories, places of stay and junction points. His reasoning is shown in figure 2. His approach can also be applied to buildings. An illustration of this is the design of a library. In the architecture of a library both physical and abstract spaces exist together. The physical space is the building which consists of several physical spaces for gathering and reading. The abstract space consists of processes for knowledge creation, consumption and to socialize (Brown 2006).

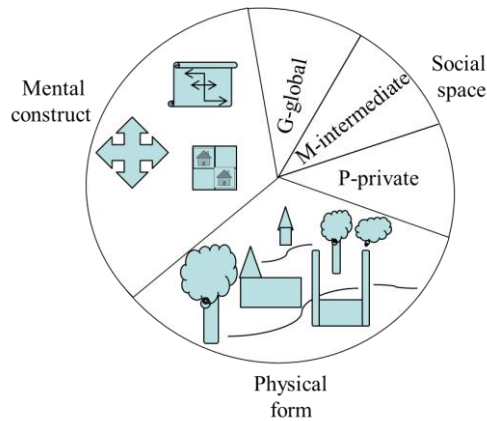


Figure 2: The design concepts of Lefebvre

Christopher Alexander stresses in his design for people the importance of wholeness. In that concept he includes the complete set of practical, emotional, spiritual and cultural needs of architecture. He developed 253 environmental patterns, such as “accessible green”, “work community”, “garden wall”, to define solutions to problems the architect faces in the creation of wholeness and rules to apply them (Alexander et al. 1977). Alexander contends that by applying these patterns in the design phase a pattern language emerges that describes a life-able architecture that includes both practicalities and delights of everyday living and supports life. In the design he focuses on the role of centers in a space that interact with each other and resonates with the observers so they experience life (Neis 2016). According to Alexander, a center is any zone of coherence that occurs in space and that space, together with centers, form the foundations of life. In the first volume of ‘The nature of order’, Alexander describes life-evoking geometric properties of those centers (Alexander 2002b: 239-241):

1. levels of scale
2. Strong centers
3. Boundaries
4. Alternating repetition
5. Positive space
6. Good shape
7. Local symmetries
8. Deep interlock and ambiguity
9. Contrast
10. Gradients
11. Roughness
12. Echoes
13. The void
14. Simplicity and inner calm
15. Not separateness



In the second volume, Alexander added a dynamic, interactive, step-by-step process to create live-able environments and places of well-being using the 15 geometric properties (Alexander 2002a). Alexander claims that this process creates density, coherence, order and thus life. The 10 structure enhancing actions that he describes in 'The process of creating life' to intensify the vitality and wholeness are focused on a step by step adoption to enhance the whole by creating uniqueness and simplicity in centers and in the most fitting coherent geometric order based on the understanding of the needs of clients and users. According to him, the process must be guided by a deep feeling of the whole. His design approach is shown in Figure 3.

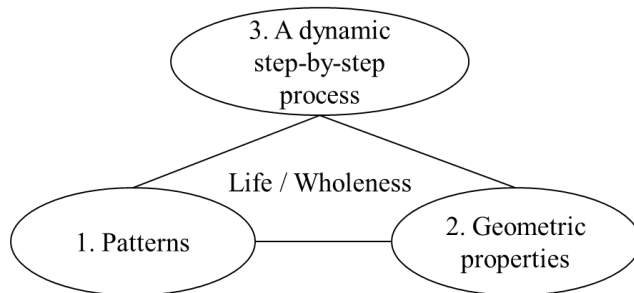


Figure 3: Creating living architectures

The application of Alexander's theory and method to bring life to a community by architecture was demonstrated on a large scale project in Japan and documented in a book (Alexander et al. 2012). It was the design and construction of the Campus of Eishin Gakuen in Japan between 1981 and 1989. During the design and construction two building systems were in competition: 1) An adaptive and dynamic system concerned with the well-being of the land and in accordance with Alexander's theory; 2) A highly rational system focused on efficiency, money, power and control. According to the authors, the latter method is the dominant production system for the environment today. During the project Alexander was persevering and rigorously applying his theory. It led, according to the authors, to physical, geometric and spiritual beauty of the Campus. Regarding the costs and quality, the authors claimed that their design and production method was cheaper and produced better quality than the highly rational design and construction methods that are dominant today. The reason they give for this claim on costs is that profit is not a goal in itself in a design for people. Since the budget is fixed in this approach, money has to be spent sensibly (Alexander 2012: 339-340). Furthermore, the authors claim that people who are studying or working on the campus feel more happy or content than on contemporary high school and university campuses (Alexander et al. 2012: 454). Of course there is probably bias in this claim because the authors are also the designers and builders of the campus, but that does not take away the fact that Alexander was rewarded in 1985 the 'Best Building in Japan Award' by the Japan Institute of Architects for the 'New Eishin University Campus' project in Tokyo as well as several other projects in Japan. Furthermore, in 2009 the buildings were still considered beautiful by Nikkei Architecture, a Japanese journal (Alexander 2012: 378).

Kyriakos Pontikis extended the design method of Alexander. He added sustainability to the concept of wholeness. He called his design method eco-humane design. He emphasized the importance of: 1) User participation; 2) An organic design process and 3) Building as making. In a case study he describes the application of his method in the design and construction of Saint Andrew Christian Church in Olathe, Kansas (Pontikis 2016: 200-209). In his reflection on that case he stresses the importance of active participation of the architect during construction. He states that ideally the architect should be the licensed contractor or a construction manager to maximize active participation, flexibility and freedom to adapt and modify the design during construction.

Combining the design approaches presented here leads to an overview of a design approach for people in architecture. This overview is presented in Figure 4.

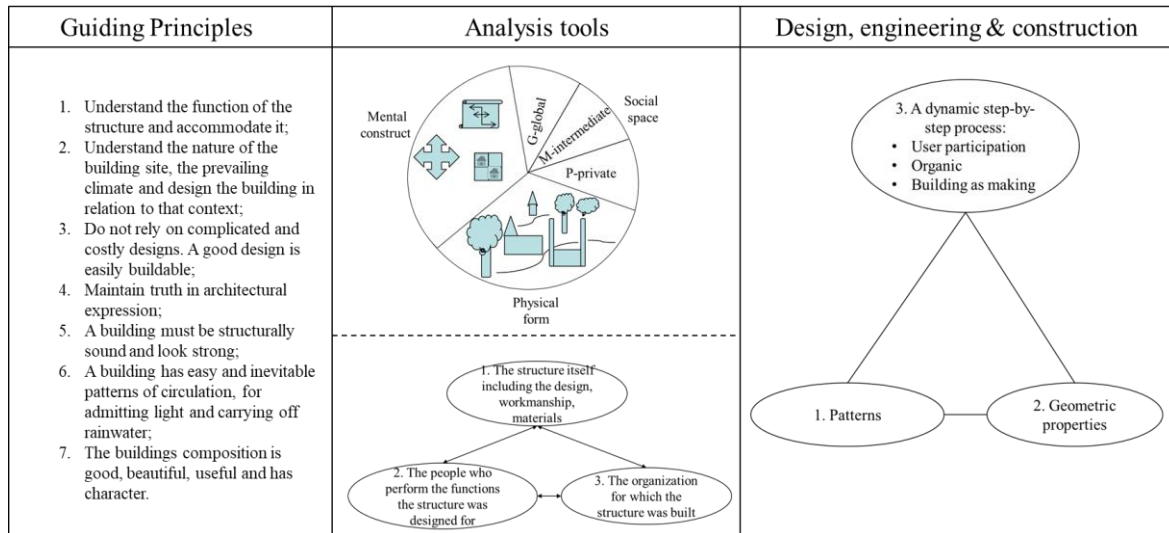


Figure 4: An overview of design for people

These design approaches for people in architecture appeared in the same timeframe new design approaches emerged in the fields of organizations and software design. That too was a reaction to the highly rational design approaches that dominated the organization and software industry in the 20th century. An influential approach is called 'Agile' which is published in 'The Agile manifesto' (Beck et al. 2001). There are remarkable similarities between 'Agile' and the presented approaches in architecture despite the fact that they have arisen in different disciplines. This contributes to the credibility of an architectural design approach for people. Just like the discussed design approaches in architecture, 'Agile' focuses on individuals and teams, human interactions, collaboration and the ability to respond to change during the design and build phases.

#### 10.5.8. Two fundamentally different perspectives on designing

Both rational design approaches and design approaches for people can be considered as problem-solving methods that includes both the process and the processed artefact (Hevner et al. 2004). The dilemma faced by architects in designing is to make decisions about the reality they perceive, but that their choices cannot have any formal justification. This applies in particular to elements of the human context that are socially constructed such as cultural, social and societal values. An architect has to enter the social worlds of people to understand their world from their point of view. The ontological position of architects determines the outcome of this process of understanding.

If the dominant position of the architect is positivistic, then social entities will only be considered if they exist independently of social actors (Langenberg and Wegmann 2004). Only entities that are regarded as real, 'rational', are included in their discourse. Entities that are socially constructed, such as cultural and social values and social life, are therefore excluded. Rationality offers them "the promise of applying the critical powers of reason to expose and remove contemporary forms of unreason, superstition, and dogmatism" (Alvesson and Willmot 1992). Central themes in this position when designing are the power with which man understands the universe and improves his own condition in terms of knowledge, freedom and happiness. (Duignan 2018). Important assumptions are that reason and logic are universally valid and there is an objective natural reality that can be represented and referred to by language (Aylesworth 2010). Furthermore, knowledge about natural reality can be acquired and can be justified on evidence or principles and general theories can be constructed that explain many aspects of the natural and social world. With that knowledge human beings are likely to change themselves and are likely to make their societies more humane, more just and more enlightened. It is the position with the belief in the capacity of humanity to perfect itself through the power of rational thought (Cooper and Burrell 1988). Choosing this position as an architect in designing leads to the exclusion of socially constructed concepts in designs. It results in rational architectures.

Another ontological viewpoint that the architect can adopt when designing is subjectivism. In this position, the architect tries to understand and explain the social world from the point of view of the actors directly involved in

the social process (Burrell and Morgan 1979: 227). According to Burrell and Morgan, it is not data or sense perception that determines reality, but a “spirit” or “idea”. They state that social reality is seen as a set of assumptions and intersubjective shared meanings that are the result of several social processes. The goal in this position in designing is to understand the subjective experience of individuals from their point of view. The architect is not an independent observer because architecture is not regarded as an entity that is independent of social actors. Each actor, such as the client, users and others that are affected by the architecture, has a personal, socially constructed, mental image of architecture. Consequently, there is no objective ‘truth’ about architecture. This implies that only the individual or a group of individuals determine, through their subjective experiences and language, what the architecture is and what values it expresses. As a result, there is not one architecture, but there are many. In subjectivist design approaches entities that are socially constructed, such as cultural and societal values and social life, are not excluded. Design and construction processes are structured so that these intangible elements can be studied and included in the architecture. For this reason, subjectivist design approaches include active participation of users, clients and other stakeholders in understanding the shared meaning of the architecture. This knowledge can also be obtained by the architect through active participation in particular contexts of social reality (Robson 2002) and through sensory experiences and experiencing practical consequences of the design (Peirce 1998). Consequently, a mix of design methods, including 3D modelling, simulations, interactive design, virtual and augmented reality and group discussions, can all be applied in the design process to identify and articulate the shared meaning of the architecture. It leads to architectures in which social and cultural aspects and the necessary symbolic expressiveness are included in addition to the functionalities that architecture should offer.

The positivist and subjectivist positions are incommensurable because they are based on mutually exclusive meta-theoretical assumptions (Burrell and Morgan 1979: 25). Therefore, an architect cannot simultaneously design from both positions. This mutual exclusivity means that choosing a positivistic or subjectivist position in designing implies that knowledge about certain aspects and effects of architecture, in particular the expression of intangible values, can or cannot be considered in the design phase.

#### 10.5.9. Conclusion

Because positivist and subjectivist positions are incommensurable, the criticism of rational architecture does not concern complete or incomplete designs. It is about what reality is, how truth about reality can be obtained and if or how that reality can be influenced by architecture. The architect has to mold space in such a way that practical functionalities come to life. The deliberate creation of meaning through that space is one of the challenges of the architect. It depends on the position the architect takes regarding these intangible aspects how meaning is considered. Either meaning is considered as not rational or it is considered a reality that can be discovered and influenced through architecture. In order to avoid fruitless debates and clashes during design and construction, as illustrated by the case of the Campus of Eishin Gakuen in Japan, the position of the architect, client, users and other stakeholders regarding reality should be known in advance.

If cultural, social and social values are to be included in the design, then subjectivist design approaches are suitable. They contain processes and artefacts that apply for that purpose. These approaches take into account who determines which values are the ones to express in an architecture and which timeframe is used as a reference. The use of a subjectivistic design approach involves the following:

1. Active involvement of and an explicit focus on people in design and construction;
2. Dynamic design and construction processes;
3. Identification of requirements that follow from cultural, societal and social values;
4. A focus on wholeness, both in concrete and abstract space.

Subjectivist design approaches can be applied in modern ways of designing and building, such as industrialized construction. They can prevent a dominant focus on rationality, productivity and profit. However, the industrialized way of design and construction contain a number of these rational elements. Consequently, this way of designing and building and subjectivist design approaches are at odds with each other. Therefore, further research is needed to determine how these approaches can be used in combination during design and construction without obtaining suboptimal solutions and fruitless debates.

Whether positivist or subjectivist approaches are chosen when designing, architecture can still be regarded as an art and a craft to design and create buildings that provide predefined functionalities and have meaning in the physical, sociological, economic and cultural space of society. It is this element of 'art' that is elusive and not fully understood and included in the design approaches that have been studied in this research. What is meant here is expressed by architect Le Corbusier: "You employ stone, wood, and concrete, and with these materials you build houses and palaces: that is construction. Ingenuity is at work. But suddenly you touch my heart, you do me good. I am happy and I say: This is beautiful. That is Architecture" (Corbusier 2008: 215).

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## **10.6. Urban planning as an instrument of better standards of living- Case of shantytown**

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The introduction of shantytowns in Latin America came as a result of a major migration from rural areas into urban areas to obtain financial security. Citizens are migrating from rural areas to urban cities, posing a threat to their governments, as their basic necessary needs cannot be met. Government's lack the provision of these necessary needs, leaving its citizens to fend for themselves and disrupting the urbanization of the cities by creating informal housing known as shantytowns. These shantytowns hamper the quality of life of its residents, often lacking basic amenities like clean water.

The purpose of this paper is to analyze regulatory effectiveness in reducing the proliferation of shantytowns in order to provide a better standard of living for citizens. In this paper, we will address the origin of shantytowns, why do people migrate to shantytowns, the conditions inside shantytowns, the basic needs in shantytowns, the government proposed strategy for the urbanization of shantytowns and a success story from Villa El Salvador in Peru. These subtopic are connected to the urban trends in connection with crime, violence, unlivable standards and transportation. The failed governmental aid proves to not provide the certain necessary needs for its citizens such as: clean water, safe waste disposal, safe building infrastructure, security, police patrols and units, job security and job skills. The findings show some innovative ideas to facilitate the process of the rural migrants and increase the integration of these people into urban areas.

### **10.6.1. The origin of shantytowns**

Shantytowns are located in underdeveloped areas, secluded zones situated in the outskirts of the city. The shantytowns originated when a large inflow of rural residents migrated into urban areas in search for better standards of living and job opportunities. The government could not allocate these people as no affordable housing was available for the rural migrants to rent or buy. The lack of availability in affordable housing gave rise to an illegal method of acquiring houses known as progressive housing.

Progressive housing implicates the occupation of a piece of land that is not zoned for urban residential use, which fails to meet the standards of housing and has an unclear property title. (Fay, 2005). This piece of land is occupied by the rural migrants without any resistance from authorities or landowners, allowing the rural migrants to construct their houses in the landowner's private land. The landowners of such properties have no means to prevent the invasion of their lands as the authorities do not enforce the law in such instances, even though it is an illegal process of acquiring land. The lack of authority gives consent for people to invade a private land with the sole purpose of building their own houses.

The government's position towards the development of shantytowns is to turn a blind eye towards the illegalities of such obtainment and do not enforce any laws preventing the expansion of shantytowns across cities. Moreover, a high number of houses inside shantytowns lack legal titles of property and it is difficult to use these properties as collateral or even putting them on sale in the housing market (Gilbert, 2001). Gilbert strongly argues that the lack of legal property title for houses constraints the owner to own such property for their entire lifetime. Thus, limiting the progression of its citizens as once they have acquired a substantial amount of money to transition themselves into better neighborhoods, they will not be able to do so because of the property they own in the shantytown.

This lack in affordable housing should be dealt rapidly and cautiously as the increasing migration from the rural areas into the urban areas affect the standards of living for many poor residents and the security of the cities. In 2015, the urbanization in Latin America was expected to increase from 77 percent to 80 percent, while the number of urban dwellers was expected to increase by 16 percent. (Fay, 2005). Furthermore, these creates a great concern about the future development of urban planning as there is no indication on which path the urbanization of a city will shift to. The concerns are not only regarding the urban planning of the city, but the

possible effects of a natural disaster occurring in the city would leave the residents of shantytowns without a house, water, electricity or food.

### **10.6.2. Why do people migrate to shantytowns?**

According to Panaragua (2012), the steady expansion of cities is outstripping the rise in population by two or three-fold due to urban sprawl. The rural areas in Latin America do not provide its citizens the necessary job opportunities or fulfill the aspirations of its inhabitants to improve their lifestyle. Thus, people migrate to urban areas in order to increase their standards of living as these areas have deeper labor markets, greater opportunities and better access to public services such as: infrastructure, health and education (Panaragua, 2012). The benefits of the urban areas are far greater than those encountered in the rural areas, therefore rural residents migrate into urban cities to secure a job that would provide them with higher salaries and benefits for their families. Yet, it is far more challenging for the rural migrant to secure a better job in the city than originally thought. The challenges these citizens face when integrating into cities are lack of skills, inability to commute to work, social and societal issues. These people are marginalized by society, secluded around the outskirts of the cities without any government assistance. Therefore, shantytowns are there city and their lives evolve around shantytowns.

Shantytowns are positioned on hills that are prone to landslides and natural disasters due to policy failure-housing construction norms and plot sizes that are out of the poor's reach. The distorted housing finance system, and inefficient land policies and land regulations assert the hazardous risk of living inside shantytowns (Fay, 2005). The utmost concern for the large inflow of people migrating into cities is finding affordable housing. Due to low wages and low to non-existent credit, the rural migrants are unable to rent or buy property, isolating them into shantytowns. Hence, shantytown residents are exposed to catastrophes such as natural disasters that would abolish their houses. The rural migrants would be incapable of recovering from a natural disaster or landslide because of their low wages and unemployment.

Once the rural migrants construct their property, they are unable to secure a job as their levels of education and skills are below the job requirements in cities. Their lack of education impedes them from acquiring a job, hindering their chances to obtain the necessary resources to buy food, water and electricity. The urban poor spend between 60 to 80 percent of their total income in food expenditure, demonstrating that the necessity of money is far greater than their levels of morale tending to push them into crime in order to obtain the resources needed to survive (Fay, 2005). Fay (2005) convincingly argues that many of the resources of the poor are a virtue of necessity and globalization has made the skills of the poor ineffective. The new levels of automation are threatening the livelihood of the urban poor. According to Varkey (2017), workers will be replaced by machines and threaten two-thirds of jobs in the developing world. Hence, the lack of education and lack of understanding of technology leave the shantytown residents vulnerable. The unlivable conditions that shantytown residents face might be worse than the ones experienced in the rural areas.

### **10.6.3. Conditions in shantytowns**

Due to its distant location, the residents of shantytowns face many pressing issues such as: overpopulation, hazard risk, overcrowding, competition for employment, diseases, lack of space and lack of infrastructure (Bbc.co.uk, 2018). The nature of shantytowns is for new rural migrants to pick a deserted location inside a shantytown on a first-come first-serve basis. Yet, when more rural migrants arrive to shantytowns, overcrowding confines the parameters of a safe location for residents to build their houses. Cornering the newcomers to build their houses in positions that are more prone to natural disasters or landslides creates a hazard risk. For example, due to the material from which these houses are built, a hazard risk might arise as a fire could devastate shantytowns because of the rapid spread in wood and the lack of firefighters in the area. Consequently, increasing the chances of a high number of casualties as a result of the overcrowding and overpopulation inside shantytowns.

Another major concern for the residents of shantytowns is the unsanitary living conditions that are found in shantytowns, which lead to a wide spread of diseases. Without any access to clean water or any sanitary services, shantytown residents are not able to fight against diseases or obtain the necessary medicines to prevent common illnesses such as flu's or cold (Bbc.co.uk, 2018). In the case of the extreme poor, flu shots might not be a necessity



as they might be considered an unnecessary expense from their eyes due to their lack of knowledge regarding a healthy lifestyle. Furthermore, the lack of sanitary services inside shantytowns such as safe waste disposal and hospitals create an even greater issue for residents who need medical assistance. Residents would not be able to attend their own health needs, increasing their exposure to such diseases.

Infrastructure is one of the most crucial problem for shantytown residents due to the lack of public transportation and electricity (Bbc.co.uk, 2018). All of these factors do not fulfill the expectations of the residents, instead they impose a greater issue for them. The lack of public transportation affects shantytowns residents as without any proper means to commute to their jobs, it reduces the chances of them maintaining a job. Hence, creating a higher competition for employment, moreover, producing this sense of competition between residents of shantytowns in order to secure a job and provide food on the table for their families. Igniting violence in the surroundings of shantytowns as people do not have the means to provide food for their families and the job market requires higher skills than the residents of shantytowns possess. Hence, the unemployed are more disposed to steal from their neighbors to provide the basic needs for their own families, creating a never-ending cycle of crime and violence inside shantytowns. This is a major concern as the amount of crimes committed inside without any police units or patrols watching the streets are higher than recorded. During the year 2012, Latin America experienced a homicide rate of 21.7 per 100,000, greater than any other region in the world (Erickson, 2018). Consequently, the government does not impose any type of regulation or control in these shantytowns, casting them aside from the city. The government's disregard of the shantytowns raises a concern for the citizens of the city as once the crime leaves the shantytowns, the city becomes the next target.

#### **10.6.4. What are the basic needs of the urban poor?**

The government should aim to provide basic needs for its shantytown residents in order to successfully integrate them into society. For residents of shantytown, a critical basic need would be the accessibility of public transportation as without any mode of transportation, they are not able to commute to work (Velasquez, n.d.). Thus, reducing the chances of securing a job. By providing public transportation in shantytowns, the government would be able to promote the progression of skills from people as they would also be connected to workshops that would enhance their skills. For example, workshops regarding the use of computer and Microsoft office usage to allow shantytown residents to work in more specialized areas and secure employment. Other workshops such as machinery repairmen would enable them to further expand their employment searching and secure a better job. If citizens are isolated inside shantytowns throughout their life, it is almost certain that their skills will never match the required skills for employment in urban areas. This could result in the promotion of unemployment, but if the government does provide public transportation for this secluded area, the effects will be positive and generate the prosperity of its citizens.

Better sanitation and healthcare are also a basic need that people search for inside shantytowns as the unlivable conditions on which the area is located increases the chances of spreading diseases (Fay, 2005). Consequently, reducing the life expectancy of its inhabitants. The lack of hospitals and healthcare are a critical issue inside shantytowns as their secluded location also limits the availability of ambulances in case of emergencies. Therefore, if governments provide hospitals or clinics near these locations, the residents are able to conduct monthly checkups and receive the appropriate medicine for their health. Yet, this issue is connected with the provision of clean access to potable water. The lack of clean water is the major cause why the residents of shantytowns are in such bad health. Without any clean water in a near vicinity, the residents are only able to drink water from contaminated rivers. If there is no government intervention, the life expectancy of its citizens will be diminished and henceforth, the national government expenditure on public health care will rise.

Police stations or police patrols are not located inside shantytowns, promoting criminal behavior in this location. There are several cases in which females with disabilities have experienced rape and sexual abuse (Hunt, 2011). Residents also are vulnerable to homicides, drugs, illicit behavior and burglary. Many residents of shantytowns are not succumbed to the rule of law, therefore designing their own laws inside shantytowns. Without police stations or police patrols, laws are not applied to any of the residents (Fay, 2005). Hence, the lack of safety inside shantytowns pose a threat to its residents as police stations are not located inside the area, therefore the law is not applied to its residents. Also, police fear the shantytowns as they are well aware of the dangers that could be encountered inside. In order to improve the standards of living inside shantytowns, the government needs to

mobilize police patrols to cover the areas and establish a police station in each shantytown to provide security. This criminal behavior could be reduced, improving the lifestyle of residents and limiting the fear and uncertain events that they might face once they leave their homes to commute to work.

A need that has not been yet discussed is an effective government intervention in the land market to reduce problems in the housing market failure. The houses in shantytowns create an issue in the housing market as the lack of a legal property title makes it difficult to put in the housing market (Fay, 2005). Thus, restricting the chances of a possible sale of these houses as well as reducing the potential of shantytowns residents to transfer into better neighborhoods. Such issues should be resolved by the government through the designation of areas in which shantytowns should be located, therefore providing residents with a legal property title in order to put their houses to sell if they choose to do so. Yet, encouraging the land market is essential for its residents, it will not improve the quality of the housing stock. Unless an adequate expansion of services and infrastructure as mentioned above are met.

#### **10.6.5. Government proposed strategy for the urbanization of shantytowns**

Government's should aim for several strategies that could be implemented in order to integrate shantytown residents into the urban areas. Henceforth, government's first step should aim to prevent the illegal developments of shantytowns from emerging in the future (Gilbert, 2001). By limiting the sprawl of shantytowns, governments could make more service lands available for new rural migrants with better access to electricity and clean water, therefore improving the living standards of shantytown residents. If the government propose a site and service scheme before the settlements, they will be able to provide such aforementioned provisions before rather than after the settlement has been made. The advantages of servicing the land before shantytowns are populated would provide the basic needs to its new residents with better access to electricity, housing, education, health care, police and public transportation. These servicing will also reduce the government expenditure that is being made to allocate such resources to invaded shantytowns and promote the progression of shantytown residents as well as increasing their life expectancy.

Contradictory to this proposed first step, many of these invasions of lands to build shantytowns are supported by local authorities, thus, shifting the views of the residents of shantytowns to not invade private lands has become a difficult task. In order to address the issue, the governments should obtain a well-functioning housing finance system to allow more households to finance the purchase of a formal sector house, by reducing the number of shantytowns located in cities (Gilbert, 2001). Putting into place, a functioning housing system, the incoming rural migrants would be able to obtain a new house rather than to construct a house with hazard risks in shantytowns. The benefits are far greater when rural migrants buy a used household that includes all the services and infrastructure the government provides. This issue serves as a lesson to governments due to the fact that cities will get older and most of their housing stock is in the form of used housing. Therefore, the buying and selling of old property should have the same financial requirements as the ones for constructing a new property.

The power of the government in allocating the inflow from the rural migration could negatively or positively affect these people. For example, in Brazil, a 'statute of the city' allowed the implementation of municipal masterplans that incorporate a series of instruments such as: special low-income zoning, development exactions, progressive land taxes on vacant lands which in theory increase the leverage of local governments over the functioning of urban land markets (Burdett, 2008). The statute of the city proves that urbanism does require government intervention in Latin America. If the government intervention is not achieved, then the decisions regarding in the urbanization and expansion of the city will be on the hands of the people. Thus, limiting the power of the government in the expansion of cities. Also, by allowing the government to classify an area as a special low-income zone, governments would be better equipped with the provision of services and infrastructure that should be implemented in these areas before the rural migrants arrive into the urban areas. Consequently, governments will experience a reduction in costs during the implementation of the abovementioned services as it would be cheaper to implement the services in an unpopulated area before the construction of houses in shantytowns.

The 'statute of the city' proves to be a successful implementation from the Brazilian government in the ongoing crisis that Brazil has on the expansion of their cities. Furthermore, other South American countries have not come

into agreements as the Brazilian government has, instead they are competing against each other resulting in the division of government agencies (Burdett, 2008). This unhealthy competition indicates the failure from governments in improving the standards of living of their citizens by providing the basic needs and affordable housing. Leading to the lack of government control in lands and enforcing laws, resulting in the creation of shantytowns. Hence, the division of governments leads to an unproductive government, in which the rural migrants have no guidance once they arrive into urban areas. Leaving the rural migrants to fend for themselves. If no government implements an enforcing agency to reduce the creation of shantytowns in order to service and provide the basic needs in other allocated zones, then it is the government that has failed its people.

In the next few years, the inflow of rural migrants will increase exponentially, creating a more serious problem for governments. Hence, new ways for allocating these people must be developed. According to the UN-Habitat's experts, the number of shantytowns could be reduced by allocating the new inflow of rural migrants into government's own created taller buildings. By building skyscrapers, it would result the migration towards the outskirts of the city and boost the population density. This strategy would be the price to pay to manage urban areas efficiently and secure sustainable development, better allocating the residents of shantytowns and allowing them to integrate with the urban area (Paranagua, 2012). Also, providing better services towards the residents of shantytowns as the basic needs would be already implemented before the people would settle down in the skyscrapers rather than trying to implement services and infrastructure in shantytowns which are prone to landslides and natural disasters.

#### **10.6.6. Villa El Salvador, Peru (Success Story)**

Due to the massive population growth experienced in Peru, grassroots organizers and representatives of the governments' social development agency tackled the issue by constructing the Villa el Salvador in Peru. It accommodated 4,000 families that lived in extreme poverty, shifting their accommodation from shantytowns into a villa in Peru (Fay, 2005). This shift allowed the Peruvian government to provide the new rural migrants with better services and infrastructure. The government was able to provide roads, electricity, school and enabled its residents with economic opportunities such as the development of small businesses and the construction of an industrial district. By combining both the development of its residents to be self-employed and allocating an industry near to the villa, it allowed the residents to choose whether to secure a job on the industry or start their own businesses. Thus, engaging more with the residents rather than limiting their choices. The industrial district allowed people to commute to their jobs without any issues as public transportation was provided by the government. Hence, solving a major issue that must shantytowns face regarding the access to public transportation.

The Villa el Salvador also proved to be different from other shantytowns due to its strong ties with the state, giving its residents the knowledge and confidence to engage with the state. This played a major role towards the success of this villa because of the direct community input into the design process. The villa was designed in such a way that would allow the residents to engage with the government as well as with the other citizens, creating a sense of unity and belonging for its residents (Fay, 2005). Furthermore, increasing the standards of living and living to the expectations of the rural migrants once they migrated into the city. The Villa El Salvador in Peru proves to be the most successful shantytown in all of South America due to the link between the government and its people, allowing people to interact with the government and the government listening to the basic demands of the residents.

The outcome of the Villa el Salvador is a lesson for Latin American countries on how to successfully integrate the rural migrant into urban areas. By engaging with the shantytowns, the residents of shantytowns had the opportunity to progress economically as well as obtain the basic needs required from the government and increase their life expectancy. If residents of shantytowns and governments are able to unite, then progression could be achieved for both the government and their citizens. This lesson could also be applied to several Latin American countries such as Ecuador, in which the separation of the government and its shantytowns residents create a constant conflict in society. In Ecuador, governments could better attend the needs of the shantytown residents by providing employment opportunities near shantytowns or developing a housing complex next to industries that would allow the residents to secure employment. This proposed implementation would allow the Ecuadorian government to better integrate and allocate shantytown residents. Thus, promoting the progression

of its citizens as the Peruvian government did. Also, reducing the further expansion of shantytowns in the outskirts of the city.

### 10.6.7. Conclusion

As seen throughout this article, many of the resources of the poor are a virtue of necessity, therefore more inclusive economic policies are important to increase the resources of the poor. In the process of globalization, many of the rural migrant skills have become ineffective as their resources were conditional on the presence of employment that would support their families. Automation is eradicating many of the low-skilled jobs that have already been transferred to offshored richer countries. Hence, the impact that automation will have on the job security of low-skilled workers will be greater than expected as seen in countries such as Mexico (Varkey, 2017). One of the countries who are suffering the most are Mexicans as they find themselves less competitive in the international labor markets, making them more exposed to drugs and violence. It is necessary for the governments of these underdeveloped countries to conduct on the job training or workshops to further develop the skills of the rural migrants, without any further development, their job security will be at stake. Also, without any further development of skills, the unemployment level in underdeveloped countries will increase. Thus, leaving automation to consume their jobs producing an economic crisis. The government does have an option to subsidize several training programs such as computer software in order to fulfill the most basic job requirement. This will prove to be beneficial for the reduction of shantytowns and the new rural migrants as it will increase their prospects and development of their skills, allowing them to progress throughout their lives.

Latin America experienced in 2015, a three percent increase in urbanization and a 16 percent increase in the number of urban dwellers (Fay, 2005). Consequently, a solution could be implemented to better integrate the new rural migrants and reducing the number of shantytowns by creating taller building that could fit more families. It will reduce the wide expansion of cities and move it towards a taller expansion. If governments are able to create skyscrapers that could accommodate more families, they will be available to provide the basic needs and infrastructure required by its residents. Thus, services such as: electricity, public transportation, security, potable water and the reduction of hazard risks will be reduced. The implementation of the Villa el Salvador prove that governments and people could work together and improve the integration of rural migrants or urban poor into cities. Allowing these people to secure better jobs to also provide the necessary needs that their families require. The reduction of shantytowns relies on an efficient interaction between the people and the government. The successful story from Villa el Salvador proves that the integration of shantytown residents belongs to the ability of the government and its people to unite and progress. In order to increase the standards of living of shantytown residents, further research should be focused on housing market regulations, in better allocation of rural migrants and in the provision of workshops subsidized by governments. Thus, reducing the number of shantytowns in the cities and providing better housing to the rural migrants.

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## **10.7. Westernization efforts in the urban planning of Turkish cities in the late ottoman and early republican periods: bursa as a case study**

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### **10.7.1. Abstract**

The attempts of the Westernization of economy, management policy, and urban development in Turkey have began in the decline period of the Ottoman Empire in 1830s and have continued in the establishment period of the Turkish Republic and thereafter. In Ottoman Period, westernization have been seen as a reorganization process of military, local government services and urban management, while it have been seen as a reconstruction process of urban, social, and economic development of Turkey in Republican Period. The urban morphology of many Turkish cities has been reshaped due to the Westernization attempts on different fields.

This paper focuses on discussing the effects of westernization efforts on the urban development of Turkish cities. Bursa, which includes the traces of urban development decisions of western educated local governors and western planners, was chosen as a case study.

**Keywords:** Turkish Westernization, Foreign planners, Urban planning, Reorganization, Reconstruction

### 10.7.2. Introduction

The idea of Westernization for the social, economic and urban development of Turkey, which is situated between Europe and Asia, the two continents that represent the West and the East in universal literature, has always been emphasized in various periods in history. The Westernization attempts that began in the recession and decline process of the Ottoman Empire have continued in the establishment period of the Turkish Republic and thereafter. However, modernization attempts in these two periods, which have a wide influence in different fields, from economy to politics and from urban design to local government organization, differ from each other in terms of conceptual infrastructure and application areas (Bozdoğan, 2001; Tekeli, 2001).

Westernization attempts, which started during the decline period of the Ottoman Empire mostly as a result of external pressures, were in the form of a general reorganization. These attempts which involved the organization and regularization of military and civilian domains were aimed at the modernization of state structure. As a reflection of this aim, various military and civil institutions were established in state administration. Not only were the Ottoman army and state administration system modernized in this period, but also the local government system was organized, and the spatial organization of cities was reevaluated according to the changing life styles (Yerasimos, 1992).

The Westernization concept in the Republican period, on the other hand, was based on the idea of restructuring rather than reorganization. With the establishment of the Turkish Republic after the decline of the Ottoman Empire, the concept of Westernization was evaluated in another context, which can be explained with the following words of Atatürk: "To reach the level of contemporary civilizations". This concept was based on an understanding which aimed to reach the economic, political, technological, and social standards of Western countries rather than copying the West or organizing according to Western norms. The Westernization attempts in this period comprised of a wide spectrum similar to the Ottoman period. However, one of the unique issues of Westernization in the Republican period was the reorganization of urban life (Tekeli, 1998; Aksoylu, 2003).

In the context of this paper, the influence of Westernization on urban planning in the period from the late Ottoman era to the 1960s in the Republican period will be analyzed. In the light of this analysis, the urban development of Bursa in the period of concern will be discussed. Bursa is a unique example in terms of Westernization attempts and the activities of foreign planners. The endeavor for the Westernization of the physical structure of the city, which was initiated by local governors who were entrusted with various duties in the West during the Ottoman period, continued in accordance with the proposals of foreign architects and planners in the early years of the Republic. Although the decisions of these planners have not transformed the total physical structure of the city, each planner has left various traces in the development of the city (Dostoglu & Vural, 2002). Evaluated in this context, the physical structure of Bursa, which reflects traces of the planning trends in various periods rather than a single planning concept, comprises important potentialities for reinterpretation by researchers. The aim of the reinterpretation in this paper is to discuss traces of the planning decisions in the development of the physical structure of the city and the various changes that have developed spontaneously.

### 10.7.3. Westernization as a Reorganization Process in Late Ottoman Era

Westernization attempts in the Ottoman Empire, which started with Selim III in late eighteenth century, continued with the reforms of Mahmud II, and resulted in the Beneficial Reforms (Tanzimat Fermanı) of Abdulmecid in 1839 (Yerasimos, 1992). The external pressures from Western countries in the Ottoman Westernization and Reform process were an important incentive in the realization of legal and administrative improvements (Zurcher, 1998). The two principal aims of the Westernization process in this period were the support of state authority with an army trained according to modern methods, and the importance given to technological and economic development. The institutional organization in state administration, education, and law in the West were transferred to the Ottoman state. Also, many issues related with French and German political modernization were adopted in order to achieve these aims (Mardin, 2001). In addition, the Ottoman embassies established in Western countries in this period played important roles in the transfer of ideas related with science, technology, and state administration to the Ottoman Empire. The statesmen, who were given responsibility in the embassies, made it possible to educate directors that were acquainted with the West and to

invite Western experts, with various fields of interest, to work in the Ottoman Empire (Aksoylu, 2003; Dostoglu & Oral, 1999; Saint-Laurent, 1996).

An understanding of reorganization lies at the roots of the changes that have developed as a result of the 1839 Beneficial Reforms which are generally considered as the beginning of Ottoman Westernization. In fact, the literal meaning of “Tanzimat” is “to organize” (Dumont & Georgeon, 1996). One of the areas where this approach has been most influential is the reorganization of municipalities and the physical structure of cities.

In the process of Westernization efforts, the Ottoman economy and its institutional structure started to change after the 1840's. As a result, public and individual domains in Ottoman social structure were also transformed, and individual rights and ownership were formalized. In the process of socio-economic changes in the Ottoman Empire, the political organization was transformed as Ottoman leaders searched for new administrative systems. While the Ottoman State administration was based on military and juridical institutions before 1840, a third institution, which was basically civilian, was established thereafter. In this process, the traditional Ottoman administrative system in which the judge of Islamic canon law was entrusted with many responsibilities changed. However, the first Municipality was established in Beyoglu, Istanbul in 1858, followed by other municipalities especially in harbor cities and in cities with dense commercial relations (Dostoglu & Oral, 1999).

The social and economic transformation created by the inclination of the Ottoman Empire towards the West caused the form of trade to change, new modern centers to be implemented outside the traditional urban centers, car and trolley usage to begin as a means of transportation in cities, new housing areas to be developed, and different housing areas to appear based on social stratification (Yerasimos, 1992).

New vehicles made it inevitable for traffic organization in urban areas to change, as a result of which cities were rebuilt and reorganized. The construction of wide streets and harbor areas in order to eliminate narrow streets and cul-de-sacs gained importance during this period. Certain regulations were applied in the construction of wooden houses which constituted Ottoman urban morphology, and the construction of stone buildings was encouraged as a means of fire safety. In addition, new neighborhoods, based on grid-iron pattern, were implemented in this period for migrants who came to Bursa either from inside or outside Anatolia. Besides the physical organization of cities, the new commercial, economic, and social relations with the West required new building types, such as hotels, train stations, post offices, banks and office buildings to be constructed in cities (Saint-Laurent, 1996; Dostoglu & Oral, 1999; Murphey, 1999).

#### **10.7.4. Westernization as a Restructuring Process in Early Republican Era**

The nature and aim of the Westernization attempts in late Ottoman Era were different from the Westernization attempts after the establishment of the Turkish Republic. The Westernization attempts in the Ottoman era were mostly directed towards the regeneration of an empire that had declined, by means of certain reorganizations. On the other hand, the Westernization attempts in the Turkish Republic have involved restructuring the political, social, and spatial organization of a new state established after the Independence War. The basic idea in this process was the creation of a politically, economically, and socially strong Turkey, which would find its place in universal civilization. The realization of this aim would be possible only by attaining the economic, technological, and political power of Western civilizations. In this context, the modernization of the Turkish Republic did not mean reorganization based on the direct application of Western norms, but the restructuring of a new system by taking these norms as examples. Thus, Modernization in the Republican Era has been equivalent to “Becoming Westernized in spite of the West” (Tekeli, 1998; Bozdoğan, 1998).

In this process, a lot of importance was given to the spatial and social organization of cities in the Turkish Republic. New social and cultural institutions established in cities were used as a means to make people identify themselves with this new modernization project; in addition, an approach considering different dimensions of Western life style was adopted in the construction of cities (Akcan, 2005). Important commissions were given to foreign architects and planners in the restructuring project of this period because of the lack of experts in Turkey. Therefore, these experts have left traces of popular design approaches in the West, on various Turkish cities that they planned in that period. In this process, these planners have played important roles not only in the planning of metropolitan centers such as Istanbul and Ankara, but also in the development of other large cities such as Bursa, Izmir, and Adana.



One of the most important aspects of Turkish Westernization was the creation of nation-state consciousness. Turkey, as a nation-state which was established as a result of the disintegration of an Empire, experienced a process which was more different and difficult than the nationalization process of European countries. In the process in Europe, spatial totality developed as a result of the formation of national identities and the disappearance of feudal identities in various regions. In contrast, after the disintegration of the Ottoman Empire, the nations that formed the Empire were separated rather than united.

It is believed that the success of such a modernity project was dependent on the creation of national consciousness, based on rapid and planned transformation in the country (Cecen, 1990). In this transformation process, a restructuring took place in political, economic and social spheres, resulting in national and urban spatial organization strategies, which were developed as a physical reflection of the restructuring in this period (Tekeli, 1998). An evaluation of these strategies reveals that while the influence of economic and political restructuring was prevalent in the spatial organization strategies at the national scale, traces of social restructuring were seen at the urban scale.

An analysis of the spatial organization strategies implemented at the national scale shows that much importance was given to industrialization in this period in order for the Turkish Republic to become an economically strong state. Each new factory constructed in this period was seen as a significant step enabling Turkey to reach the level of developed countries (Ahmad, 1995). With this aim in mind, factories were constructed not only in big cities, but also in respectively small cities, such as Kayseri and Usak, in order to expand reorganization in industry at a national scale. In the process of spreading the attempt for industrialization at a national scale, railroads were constructed in order to unite the whole country. Another important aspect of the Westernization process of the Turkish Republic was political restructuring. In this process, parliamentary system and democracy was adopted in place of the monarchic system that was dominant for seven hundred years. As a reflection of this change, Ankara was declared as the capital of the Turkish Republic, instead of Istanbul. The choice of Ankara, which was a small city in Central Anatolia, with no unique economic, political or architectural qualifications, as the capital had a distinctive meaning in this period. In fact, Ankara was suitable for the physical application of the political, social and spatial characteristics of the newly established Turkish Republic. In addition, the location of Ankara in the middle of Anatolia distant from corrupting influences, and its identity different from the cosmopolitan structure of Istanbul, was found suitable in becoming the capital of a nation-state which was in the process of contemporarization (Batuman, 2005; Tekeli, 1998).

The transformation in economy and politics in the early years of the Republic made it necessary for a simultaneous social transformation. The main component of this social transformation was the idea of disseminating the nation-state ideology, which was one of the basic principles in the foundation of the Turkish Republic, to large groups of people. Thus, cities, which spatially reflected this idea, were chosen as the spaces of modernity. The understanding which characterizes this period was described by the National Hero Ataturk as the following: "cities are examples of health, beauty and modern culture" (Tekeli, 1998). However, an analysis of this period reveals that Anatolian cities had been destroyed extensively during the war, and that most of them had been burnt or demolished. In addition, industrialization and migration from rural areas to cities started in the period after the war. Therefore, concepts such as urbanizing and urbanization gained a lot of importance in this process. New institutions such as community centers (*halk evleri*) were established in relation to urbanization, and urbanization culture and nation-state consciousness were emphasized in these institutions. New urban centers called "Republican Squares" ("*Cumhuriyet Meydanı*") were declared in the social and administrative centers of cities, with community centers and various administrative institutions related with state administration being clustered in these squares (Yeşilkaya, 1997). In terms of urbanization, the emphasis was on urban planning.

Urban planning studies which started first in Istanbul with Melling's partial plan in 1802 and with Moltke's comprehensive plan in 1842 were applied in other Turkish cities after the 1850s. The first plans that were prepared during the Ottoman Empire did not generally comprise proposals for the entire city. Instead, partial plans were generally proposed for limited areas by Western survey engineers. During the early years of the Republic, the cities that were demolished in the war were gradually improved with plans that Turkish survey engineers prepared, according to the tradition that was inherited from the Ottomans. However, new laws based

on the radical modernity project in Turkey changed this system and proposed that cities should be reorganized comprehensively by professionals, i.e. by planners and architects (Tekeli, 1980).

There were almost no Turkish experts who could realize the planning process in the early Republican period (Tümer, 1998). Thus, the policy of getting help from Western experts continued also after the Ottoman Period, and Western architects and planners were invited to Turkey to work on urban planning proposals during the Republican Period. Another factor that speeded up the arrival of Western planners and architects in Turkey was the Second World War process in Europe in the 1930's and 1940's, and the pressure of the Nazi's. In this process, especially Austrian and German scientists escaped to Turkey (Tümer, 1998).

The flow of Western architects and planners, who came to Turkey after the establishment of the Republic, started with Ernst Egli and Clemens Holzmeister in 1927. Also, it continued with professionals such as Hermann Jansen, Paul Bonatz, Rene Danger, Guilio Mongeri, Karl Lörcher, Henri Prost, Bruno Taut, Luigi Piccinato, Martin Wagner, Bruno Zevi, and Le Corbusier until the end of 1950s (Tümer, 1998; Akcan, 2005). These architects and planners have had significant influences on the planning of many cities; however, it is not possible to generalize these influences because they vary according to the characteristics of each city. Bursa is one of the cities in Turkey where Western planners have developed proposals with unique characteristics.

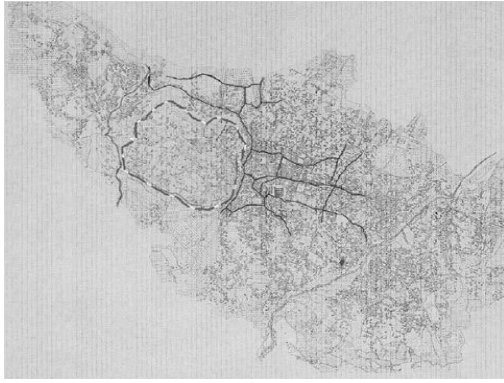
#### **10.7.5. The Transformation of Bursa From a Traditional Ottoman City to A Metropolitan Center of Turkish Republic**

Urban design, which was one of the important projects of the Westernization idea in the process from the Ottoman period until the present, was applied in various ways in different cities. In this context, Istanbul, which was the capital of the Ottoman Empire, became the first place where various rules and regulations required by the Ottoman Period Westernization project was applied (Tekeli, 1980). In addition, Istanbul was one of the most important practice centers for Western planners, who were invited for the Republican Period Westernization project. Ankara, on the other hand, which was a small city in the Ottoman era, was declared as the capital after the establishment of the Turkish Republic. Many Western planners worked in Ankara in the process of transforming a small city located in Central Anatolia to the capital of a recently established state. Bursa, which was the first capital of the Ottoman Empire, is similar to Istanbul in the sense that various regulations related to urban planning were applied both in the Ottoman era, and also in the early years of the Turkish Republic (Tekeli, 1999; Yenen, 1992). The local governors, who worked in Bursa in late Ottoman era, transferred the city planning concepts that they observed in Western cities to Bursa (Dostoglu & Oral, 1999; Dostoglu, 1999). Later in the Republican period, three foreign planners developed various proposals for Bursa from 1920s to the 1960s.

In this section, the work of local governors during the Ottoman Period and the approach of three Western planners and architects who have developed proposals for the planning of Bursa in the Republican period, and their influence on the formation of the city, will be evaluated. In order to understand these influences, the historical development of Bursa will be discussed first, focusing on the physical transformation of the city in the 19th century based on Westernization efforts. Finally, the role of Western planners on the transformation of Bursa into a metropolitan center of the Turkish Republican will be discussed. In addition, their approach towards existing traditional environments in the city will be evaluated.

#### **Westernization Process in the Planning of Bursa in the Late Ottoman Era**

One of the most influential people playing an important role in the transformation of Bursa in the second half of the 19th century is Ahmed Vefik Pasha, who was entrusted with the task of applying the Beneficial Reforms in Bursa after the 1855 earthquake which inflicted great damage on the city. He reconstructed Bursa during his first two year duty as Anatolian Right Wing Inspector between 1863 and 1864, and during his second duty as a Governor between 1879 and 1882 in Bursa. The first comprehensive map of Bursa was prepared in 1862 by a group of experts directed by the military land surveyor, Suphi Bey, before Ahmed Vefik Pasha came to Bursa. This is an important document because it reflects the existing condition of Bursa right after the 1855 earthquake, before the changes realized by Ahmed Vefik Pasha in the city. In Suphi Bey's map for Bursa (Figure 1), the organic street pattern, which is a general characteristic of Ottoman urban tradition, can be observed.



*Figure 1. 1862 Suphi Bey Bursa map: The organic street pattern before the operations of Ahmed Vefik Pasha (Bursa Greater Municipality Archives). (Organic street pattern is indicated with black lines; the border of the old citadel is indicated with dotted lines)*

Ahmed Vefik Pasha, who was educated in Paris and became an Ottoman diplomat in France in 1860 benefited from his experience in France during his appointment in Bursa. He had wide and new streets opened, bridges constructed, monumental buildings and houses that were ruined during the 1855 earthquake rebuilt, and tiles repaired. He also took measures related with health and economy (Saint-Laurent, 1996).

The contribution of Ahmed Vefik Pasha to the physical structure of Bursa and its planning can be analyzed in three dimensions. First, Ahmed Vefik Pasha aimed to change the dead-end streets of the city which were suitable for pedestrian and animal traffic into an organized street system for vehicular traffic. With this purpose in mind, the geometric standards of some streets in the city were improved. The second contribution of Ahmed Vefik Pasha was the renovation attempts by means of partial plans after the frequent fires in the city where wooden housing areas were widespread. The third important contribution was the planning and development of new neighborhoods in grid-iron pattern for the settlement of migrants (Saint-Laurent, 1996). In the 1910 map (Figure 2), the contributions of Ahmed Vefik Pasha to the geometry of the main axes, and the grid iron pattern of the newly established neighborhood in Altiparmak district on the north-west part of the city can be clearly observed.



*Figure 2. 1908 Bursa map: The main arteries and the new neighborhoods developed after the operations of Ahmet Vefik Pasha (Bursa Greater Municipality Archives). (Grid-iron pattern of the new neighbourhood area and newly opened main arteries are indicated with black lines; the border of the old citadel is indicated with dotted lines)*

### **Westernization Process in the Planning of Bursa in the Early Republican Period**

The transformation process that Bursa experienced after mid-19th century has also continued in the Republican Period, and Bursa has changed in accordance with the Westernization aims of the Republican governments, gradually reflecting the typical dynamics of developing countries. As in other Turkish cities, the effects of the contemporization project on the urbanization practice in Bursa can be observed more easily in the Republican period. Although the city was developed according to partial plans in the Ottoman period, a new understanding based on the preparation of comprehensive plans, related with the entire city, was adopted in the Republican Period (Tekeli, 1999). Due to certain characteristics such as its geographic proximity to Istanbul and its

commercial importance since the Ottoman Period, much importance has been politically attributed to the urban development of Bursa, and some of the Western planners who prepared plans for Istanbul were traditionally asked to work on the planning of Bursa.

The first planning study for Bursa in early Republican Period was prepared by Lörcher (German) in 1924. This plan had the influence of Ebenezer Howard's garden-city concept which was a popular trend in the city-planning debates in Europe during this period. In 1940, Henri Prost (French) prepared a plan for the development of Bursa and his plan had the influence of French tradition of axial planning which had its roots in Haussman's planning concept for Paris. The last Western planner, Piccinato (Italian), proposed the linear development of the city in an organic form in his 1960 plan for Bursa. His study included the idea of functional zoning of the city which resembled Garnier's conception for Cité Industrielle.

#### **1924 Lörcher Plan and the Garden-City Concept**

Karl Lörcher, who was in Turkey from 1924 to 1926 and prepared development plans for Ankara and Istanbul, and made proposals for repopulating Tracia region in this period, also prepared the first city plan of Bursa in 1924 (Lorcher, 1940). The Lörcher plan, which was applied on the existing map of Bursa prepared in 1921, was influenced by the Garden City concept of the period and was based on an understanding which disregarded the existing organic pattern in Bursa (Batkan, 1996). Since the Garden City proposal developed by Ebenezer Howard aimed to unite the positive aspects of the country and the city, this proposal could be suitable for cities with reasonable population increase. However, Bursa has experienced rapid population increase due to interior and exterior migration throughout history, but especially after the establishment of the Turkish Republic. Therefore, the Lörcher plan could not be applied in Bursa and was left as a mere sketch. Only a few traces of this plan can be observed in Bursa as at present, such as the construction of the Hisar entrance of Atatürk street (Batkan, 1996).

Tekeli explains that behind the garden city proposal, which was influential in the planning of many cities during the urbanization process in Turkey in that period, was the desire to create a "beautiful city" (Tekeli, 1998). City beautiful movement was based on Haussmann's urban concept which was enriched with romantic characteristics. In other words, this was a romantic movement proposing the construction of houses in gardens; parks and pools which would embellish the city; and monumental squares with architectural quality (Tekeli, 1980). In the application of this approach in Turkey, a settlement pattern, comprising houses in gardens in the newly planned areas was proposed. However, this shows that the existing urban pattern was not respected. In this context, the planning approaches which adopted the garden city movement in this period can be criticized from two perspectives. First, the prepared plans were not in accordance with the traditional pattern of Turkish cities and could have a harmful effect on the existing pattern; second, the plans were prepared with an aesthetic approach without considering economy and application problems in the city. Due to the fact that the resources of municipalities in Turkey were limited, plans based on the garden city concept could only be partially applied in new neighborhoods. The inability to apply this planning approach in historical areas was fortunate in a sense because its problems were generally not revealed (Tekeli, 1998).

#### **1940 Prost Plan and Axial Planning Concept**

Due to the problems in the application process of the plan prepared by Lörcher, who did not take into consideration the existing urban pattern, Henri Prost, who had started planning Istanbul in 1936, was asked to prepare a new plan for Bursa in 1938. Prost who worked on the planning of Bursa from 1938 to 1944 had an approach similar to the axial planning approach adopted by Haussmann in Paris during the second half of the 19th century. At the root of this approach was the aim of making the city suitable for vehicular traffic, and bringing services, such as sewerage, water, electricity, to the city. In order to realize these aims, Prost wanted to define and widen the streets in Bursa, and therefore he proposed legal expropriations to be realized without any hesitation (Prost, 1941) (Figure 3).



Figure 3. 1940 map: The Altıparmak district of Prost, the development plan proposal for Ruscuk area (N. Dostoglu & T. Vural Arslan archives).

Prost proposed the unproductive parts of the Bursa plain to be reserved for settlement, existing housing areas to be improved, and an industrial district to be constructed on the south of the railroad, along the Gemlik Road. The construction of Darmstad Street on the axis of Muradiye complex, Gazcılar Street on the axis of Emirsultan, and Atatürk Street on the axis of Green Tomb was realized according to the principles of this plan (Batkan, 1996).

Another proposal of Prost was to construct porticos at the newly formed commercial axes for protecting people from undesirable weather conditions, such as the sun and the rain. In fact, the successful application of this concept at Atatürk Street in Bursa is a reflection of the Prost Plan (Prost, 1941).

In the plan report that Prost prepared, he frequently emphasized that the natural beauty of Bursa should be protected; also, he proposed pedestrian paths and parks around Çekirge and Gökdere. Another aspect that Prost emphasized was the rich thermal springs of Bursa. Prost stated that these rich thermal springs could have an important role in making Bursa a touristic center and proposed Çekirge and its vicinity, where these springs exist, to develop as a resort area with hotels, motels, and thermal facilities (Prost, 1938). Prost's proposal for the construction of new roads would facilitate access to the thermal areas in Çekirge district.

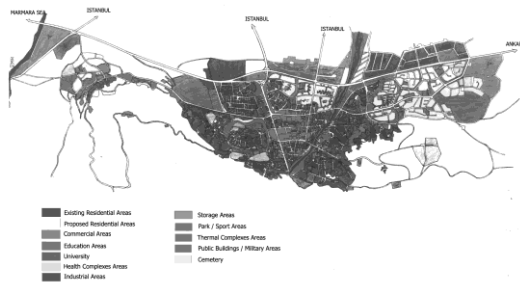
The main problem of the Prost plan was its application of axial planning principles in Bursa without considering the traditional settlement pattern. In fact, Prost did not mention anything about the preservation of the traditional settlement pattern in the process of legal expropriations which he proposed in his Plan Report. He stated that preserving the traces of roads that were constructed centuries ago to serve other purposes was not wise, and that it was necessary to shape the city according to new requirements. He did not object to the demolition of particularly wooden houses and proposed this process to start before people living in Bursa becomes rich and starts building houses from stone or brick, which would not be easy to demolish as the wooden ones. Prost was only interested in the preservation of monumental buildings. He proposed that monumental buildings such as Green Tomb, Emir Sultan Mosque, and Yildirim Complex should be emphasized in the city by planting greenery around them. He further stated that the settlement pattern around these monumental buildings could be preserved in the form of entire streets in order to reflect the historical background of the city (Prost, 1941). Due to the problems in application, Prost's plan could only be partially realized in Bursa; however, it formed the background for the plan prepared by Piccinato in 1960.

#### **1960 Piccinato Plan and Organic City Planning Concept**

After the massive fire that ruined the historical urban center of Bursa in 1958, a Planning Office was established in Bursa with the support of İller Bank and İmar Bank. Prof. Dr. Luigi Piccinato, who was responsible for the planning of Istanbul previously, became the consultant, and architect Emin Canpolat became the director of this office. The Planning Office prepared the 1/4000 plan of Bursa in 1960 (Figure 4). In addition, Piccinato also worked on the replanning of the central Commercial District in Bursa, which was ruined during the 1958 fire (Vural, 2000).

Piccinato, who prepared the plan of Bursa for 250.000 inhabitants in 1960, proposed the city to develop organically in the form of distinctively defined sectors, in a linear axis from east to west along Ankara-Bursa-Mudanya road. In order to support this development, Piccinato proposed the construction of a small industrial district at the east end of the city on Ankara road, and an Organized Industrial District on Mudanya road

(Piccinato, 1959). He defined the different zones and urban services in his plan, and related these zones with a rational street system. The historical center of Bursa was preserved while a new center was proposed on Fomara Street, and the administrative center was planned on Hasim Iscan Street. New development areas were proposed to the east, west and north of the city, and the main highway on the north of Bursa was constructed as a result of these decisions (Batkan, 1996). Piccinato, similar to Prost, stated that Cekirge and its vicinity could be treated as a resort center by supporting thermal bath tourism. His approach was based on the idea of functional zoning of the city which resembled Garnier's conception for Cité Industrielle.



*Figure 4. 1960 Bursa map: The plan that Piccinato prepared for the development of Bursa (Bursa Greater Municipality Archives).*

Piccinato, whom Prime Minister Adnan Menderes entrusted with preparing the plan of Bursa, adopted an approach based on the preservation of the traditional urban pattern in contrast to the politics of Menderes, who frequently applied the destructive aspects of modernism. In an article where Piccinato stated that Bursa has a rich cultural heritage rooted in the past, it was emphasized that the planning of a city is not possible without understanding the history and culture of that city (Piccinato, 1961). In the manual of instructions accompanying his plan, Piccinato divided the city into zones in order to define the interventions to be applied on the existing pattern and the characteristics of the newly formed regions. In this zoning, he emphasized that renovation projects should respect the existing pattern in historical urban areas, and signified the proportions such as the height and the width and even the colors of newly constructed buildings so that they could suit the existing pattern. While Piccinato stated that new buildings, to be constructed in traditional urban areas, had to repeat the architectural style of the traditional urban pattern, he allowed all kind of materials to be used. He also stated that only small additions, such as kitchen, storage, and garage, could be made to existing buildings for adapting them to contemporary conditions (Piccinato, 1959).

Although the Piccinato plan comprised rational principles for the development of Bursa, there were many problems related with the application of the plan. In fact, when the 1/1000 application plans were prepared, the population density was increased in many neighborhoods since the historical site principles were not accepted yet. As a result, many apartment buildings were constructed near traditional houses and on streets which were appropriate for low-rise housing units. Namazgah, Ipekçilik and Atatürk Streets can be given as examples to this development. Another problem was related to the uncontrolled growth of Bursa. The city grew so fast due to massive internal and external migration that the Piccinato plan became inadequate shortly after it was completed.

#### **10.7.6. Conclusion**

None of the proposals of the foreign planners who worked in Bursa have been totally realized. The political and economic fluctuations, which the Turkish Republic experienced, played an important role based on the inability to implement these plans. The fact that the garden city concept of Lörcher or the axial planning concept of Prost, which do not suit the traditional morphology of Bursa, were not realized may be considered as positive in the sense that the unique characteristic of the city was preserved. Furthermore, Piccinato's proposal for a low density city could not be implemented because of the rapid migration that the city experienced after the 1960s.

As emphasized in this study, the concepts in Western urban design literature have not been copied literally in the Westernization process of Bursa. Nevertheless, these concepts have been used in various ways in the urban development process of the city. The influence of these planning approaches can be seen in some of the main arteries that were implemented for the development of the city and in certain neighborhoods. However, the fact that the city was never shaped according to the rules of a single planning approach embodies a unique value for the preservation of the original characteristics of the city, and also for enabling its use in a more productive way.

Consequently, the amount of research related with the urban design history of Bursa in its Westernization process is unfortunately insufficient. In the majority of these works, the subject has been approached only theoretically. Therefore, the evaluation of various information, documents, and data on the planning history of the city that exists in different institutions in the context of this paper, based on the development of a comprehensive analysis, is expected to open new horizons for further studies

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# 11. Public Real Estate

## 11.1. Public real estate in transition: The quest for efficiency, flexibility and legitimacy

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### 11.1.1. Introduction<sup>22</sup>

Public real estate in The Netherlands represents a value of € 85,5 billion euro<sup>2</sup>. This capital is tax payer's capital and therefore deserves good management with an eye for both financial and societal aspects. Three important developments have led to a decreasing volume and a changing need for public real estate.

#### *The organization and management of the central government*

The public real estate in The Netherlands is in transition: the central government is organizing itself in a slimmer and more efficient way (the so called operation "Compact public service"), several ministries are merged, regional police units are combined into "The National Police Force" and the armed forces are reduced in size. Due to these transformation processes the need for office spaces, police stations and military barracks decreased.

#### *National health care policy*

The organization and the financing of health care for elderly in the Netherlands has radically changed the past ten years (see also Cor van Montfort and Li Sun, 2013 and Cor van Montfort, Li Sun and Ying Zhao, 2017). Elderly have to live at home longer than before and receive for as long as possible care at home before they can go ('are indicated for') to a nursing home. This change in national health care policy, has led to decreasing demand for 'old style' nursing homes.

In addition, some of the responsibilities for elderly care are decentralized from the national government to the municipalities, the local authorities. Municipalities decide on peoples' rights and level for home care, and on rights for devices that make life more comfortable (like a walking frame or a stair lift), including subventions for domestic help. Furthermore, the provisions for care and living in a nursing home are separated. The consequence of this is that elderly can 'live where they want' and can buy 'care at home'. This replaces the old system in which the financing of care and living facilities in nursing homes were combined. In the long run most of the homes for residential care will probably disappear as a result of the policy change. At the moment (summer 2018) The Netherlands is still in a period of transition: existing nursing homes are not always fit for elderly who need very intensive day and night care. Beside this the medical staff is often not very well trained to take good care for this very old and needy group of elderly.

#### *Societal developments*

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<sup>22</sup> The authors want to thank their colleagues from the Netherlands Court of Audit Okke van der Maas, Sicco van As, Lieke van der Sanden and Tanneke van der Smitten for their comments on an earlier version of this paper. <sup>2</sup> Value in 2015, only buildings (including government buildings, monuments, schools and hospitals) are included grounds are excluded. The value of € 85,5 billion represents the estimated market value (Source; CBS, statline, july 24th, 2017).

Not only government policy but also social developments affect the need for real estate. In some regions, for example, educational institutions must deal with a shrinking population and therefore a decline in the number of pupils. In some cases, this leads to demolition or redestination of school buildings.

In a number of regions also social housing corporations – which are public organizations in The Netherlands – have to deal with a significant decline in population, or with changing housing demands, for example an increasing demand for houses suitable for – needy – elderly or for singles.

Another social trend that affects the need for public real estate is the so-called ‘new way of working’. This means: less square meters per workplace and flexible office concepts. The national government and many other public institutions switch to this ‘new way of working’. For the national government this is part of the above mentioned transition into a ‘compact public service’.

The significant financial interest, the importance of a well managed public real estate and the above briefly outlined political, demographical and societal developments were reason for the NCA to start in 2011 an audit programme with a focus on public real estate. The program will end in autumn 2018. After 2018 audits on public real estate will be integrated in the regularity audit program of the NCA (see: <https://www.rekenkamer.nl/onderwerpen/vastgoed>).

#### **The Netherlands Court of Audit**

The Netherlands Court of Audit (NCA) checks whether the Dutch central government spends public funds economically, efficiently and effectively. Its statutory task is to audit the revenue and expenditure of central government. The NCA reports on its work once a year to parliament on Accountability Day (the third Wednesday in May). Parliament can use the audit opinion of the NCA to grant the government discharge, thus releasing it from responsibility for its implementation of policy. The NCA audits dozens of policy fields, from special needs education and the replacement of the F-16 fighter aircraft to measures to overcome the credit crisis. The NCA consists of the Board (three members) and its staff (about 270 [in 2016]).

*Source:* <https://english.rekenkamer.nl/organisation>

With these studies on public real estate, the NCA wants to contribute to a responsible real estate management by the government and related public organizations such as health and education organizations. It is good to keep in mind that real estate is not an end in itself, but an instrument to facilitate the primary process.

In the following section (section 2), we will briefly go into the results of six audits on public real estate, conducted by the NCA<sup>23</sup>:

- central government real estate
- defence
- national police force
- universities
- school buildings
- vocational education

In section 3 we present the real estate management analysis framework used by the NCA in most of its real estate audits. In section 4 we show some lessons learned from the discussed audit reports. And finally we discuss how public institutions can assure themselves of societal support in their real estate decisions (section 5).

#### **11.1.2. Six audits on public real estate by the Netherlands Court of Audit**

##### **The Central Government Real Estate Agency**

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<sup>23</sup> See for an overview of the developments in health care real estate: Van Montfort, Van der Maas and Noort-Verhoeff (2016, in Dutch).

In 2015 the NCA published a report about the savings that the Central Government Real Estate Agency was supposed to make.

#### **The Central Government Real Estate Agency**

“The Central Government Real Estate Agency works for and on behalf of the Dutch State. We are responsible for managing and maintaining the largest and most diverse property portfolio in the Netherlands. Our portfolio includes prisons, court buildings, military barracks, airports, defence sites, ministerial offices, ports, tax offices, listed buildings and historical monuments, museums and palaces. We make these buildings and sites available in order to meet the property needs of central government. Our expert staff develop our strategy and policy and supervise the management and maintenance, purchase and sale, construction, remodelling and renovation, and development and redevelopment of properties in our portfolio.”

Source: the website of the Central Government Real Estate Agency

(<https://english.rijksvastgoedbedrijf.nl/about-u>)

The Central Government Real Estate Agency (RVB) must make significant savings: €142 million on office accommodation and €25 million on its own overheads. There is a risk that the Central Government Real Estate Agency will not make the savings in time. The findings of the audit are presented in the first report in a series on real estate in the public sector: *Accommodated by the Central Government Real Estate Agency*. The NCA draws among others the following conclusions:

- efficiency gains could be better substantiated and actual savings were not known;
- the Central Government Real Estate Agency did not, but should use and integrated costing model (the life cycle cost approach or ‘total costs of ownership’) instead of an approach in which only the initial costs were included). Only then the actual cost of real estate, and thus government policy, will be known and clear;
- first steps have been taken to sharpen focus on social goals, but there is also a dilemma between two public goals: financial and social interests.

The NCA recommended that the minister would turn the real estate portfolio strategy into wider a semi-public real estate strategy per region that includes a real estate strategy for municipalities, care and educational institutions and other executive organizations. With such an integrated approach of public estate public interests could be better served because it will become more visible that one party wants to put down a new building while in the same place another public party has comparable vacated real estate. These insights make it easier to coordinate several building plans of both public and private actors.

#### **Defence**

The Minister of Defense had the aim to reduce € 61 million per annum in 2017 in the exploitation of military areas, barracks and infrastructure. Investigation of this plan by the NCA led to the conclusion that there is risk that the planned reduction will not be achieved in time. This is the case because, when drafting the plan, the ministry of Defense didn’t have a good picture of the occupation of the barracks. The NCA recommended therefore to make a more realistic picture of the feasibility of savings and the costs. Although the parliament is now informed of on a regular basis on the progress of the plan, it still proves to be difficult to make good estimates of the needed investments.

### **The National Police Force**

The new National Police Force that was formed on 1 January 2013 and in which all the regional police forces were merged, must save €76.5 million a year on its estate costs as from 2025. Good real estate management is critical in such a 'centralization'-operation.

Cutting the cost of public real estate is a long-term process with risks and uncertainties that must be managed effectively when huge sums of money are involved.

The NCA concluded in 2015 that the National Police Force has a real estate strategy with detailed social and financial targets. The National Police Force has also clearly allocated the tasks and responsibilities for real estate and set standards for the number of square metres per workplace and the space required for flexi-workers. These elements together form a good basis to assess the current real estate portfolio in the light of future real estate requirements.

The NCA audit also found, however, that the following elements of real estate management were not in place at the end of 2014:

- insight into the actual and planned cost savings;
- a multiyear investment programme;
- necessary expertise for the disposal of real estate;
- information on the real estate portfolio and the operation's progress.

The NCA concluded that there are risks in achieving the cost saving target. Other ambitions regarding the services provided by the National Police Force may therefore also be at risk. The NCA recommended that the Minister of Security and Justice (V&J) take notice of the current situation before pressing ahead with the National Police Force's real estate operation. He should first sort out a number of matters to prevent irreversible decisions being taken that have unfavourable financial consequences. If budgetary constraints do not permit cost-saving investments, the minister could consider forming a special-purpose reserve. To improve the management of the real estate operation and the cost saving target, the NCA also made the following recommendations to the minister:

- ensure the financial goals are up-to-date and properly understood: make clear – with concrete measures – what part of the cost saving goals has been achieved and how the remaining goals will be achieved;
- develop an integrated programme to carry out the real estate operation; it should include a multiyear investment programme, critical elements from the real estate plans, the main financial and planning risks, disposal plans, insight into the maintenance status, periodic reports that consider these elements in relation to each other, and an up-to-date understanding of the progress being made;
- use the multiyear investment programme to recalibrate the multiyear budget;
- determine whether cooperation with the Central Government Real Estate Agency can help resolve short-term issues with professional capacity and develop the expertise necessary to make large-scale disposals;
- make all real estate costs transparent by relating the real estate accounts to the financial accounts in order to create a full insight into the relevant costs of each building.

### **Universities**

The NCA published two reports concerning the real estate of universities. The first report focused on the financial supervision of real estate plans at universities and was published on October 6, 2016. The second report discussed the real estate management at six selected universities and was published on January 18<sup>th</sup>, 2018. In this part the NCA focuses on the roles played by the Minister of Education, Culture and Science and by the Education Inspectorate.

The NCA concluded that the overall financial position of the 13 universities is healthy. But the overall picture says little about the potential real estate risks that individual universities are facing.

The NCA concluded also that the annual reports of the universities provide only limited insight into the real estate and that comparing is difficult. There is a risk that the Education Inspectorate will not detect risks at individual

universities in time. The NCA emphasized that real estate risks and abuses should be detected and corrected promptly. Given the financial importance of real estate and its significance to the quality of education and research, good real estate management and effective checks and balances are vital. An internal audit department, controller and finance director are of primary importance for the checks and balances followed by the external auditor. The Supervisory Board is a key aspect of the internal checks and balances. The Board must be able to satisfy itself that the basic principles of good real estate management are fulfilled and must intervene if they are not. The NCA recommended to the minister to improve the comparability and information value of financial indicators and information about intended real estate investments in the universities' annual reports by setting further requirements.

The unexpected surprises (abuses!) associated with real estate that have occurred in other education sectors must be avoided. This only is possible when the universities' real estate management, including strict internal supervision, is in good order, and if external

supervision by the Education Inspectorate identifies risks at individual institutions in time. The NCA recommended therefore also to the Education Inspectorate to make detailed risk profiles of each university in order to detect risks in time.

Dutch universities are planning to invest more than €3 billion in real estate in the coming years. Given the importance of good real estate management, we looked at the quality of real estate management at 6 universities. The real estate management of these universities is in order, but improvements can still be made.

In the first place improvements can be made at the operational level. Information about the occupancy and use of office accommodation is missing. And new educational and housing concepts could be better applied.

At the strategical level it was striking that not all universities had adopted a real estate strategy. Also, the supervisory boards can be involved better by limiting the minimum size of investments requiring the supervisory board's approval. And the supervisory board should be involved more closely in complex financial arrangements.

Finally it's important to improve the exchange of information between the operational, tactical and strategical level.

### **School buildings**

In 2016 the NCA published a report about the quality of primary and secondary school buildings. Municipals and school boards are together responsible for nearly 10,000 school buildings in the Netherlands. More than 2.5 million primary and secondary school pupils receive lessons in these buildings. Municipals and school boards spent about €2.6 billion on school buildings in 2013. In practice, both school buildings and the (quality of) education vary. There are large differences in the age and the functional and technical quality of the buildings and in the financial resources spent on them. There are also differences in the way municipalities and school boards work together to keep the buildings in a reasonable state, as required by law. For the next years municipalities and school boards face a substantial challenge: the sharp decline in pupil numbers and the introduction of needs-based education, will also have consequences for the school buildings. This demands local cooperation. The system however, contains no incentives for the parties to work together efficiently in the long term.

The NCA recommended among other things that the State Secretary for Education, Culture and Science (OCW) should clearly formulate central government's ambitions for school buildings and lay them down as statutory requirements.

Another important conclusion was that some basic information about school buildings is not available or only in a fragmented way. It is for example unknown how many school buildings there are in The Netherlands, what floor area they have and what the occupancy rate is. The NCA pleads for better information on (the quality of) the school buildings.

### **Vocational training**

In recent years, a number of institutions for secondary vocational training have been hit by financial problems because of their housing. Various evaluation reports have been published on these problems. These reports concluded that:

- (1) Unconscious risks were taken; considerations were not made on the basis of a detailed business case and no alternatives were weighed.
- (2) The ambitious plans were based on optimistic prognoses of the number of students at the institution.
- (3) There was a poor planning and control cycle, as a result of which insufficient control information was available.
- (4) Although it was clear that the financial situation had changed, the old plans were still followed.
- (5) the internal checks-and-balances, like the internal board of supervisors, were not critical enough towards the board.
- (6) The education inspectorate received signals late and did not respond adequately.
- (7) The Ministry of Education received no signals and did not play an active role.

To prevent a repetition of history, a number of recommendations have been formulated. For example, the Minister of Education should have more possibilities for intervention, the inspectorate should play a more active role and the supervisory board should keep sufficient distance and should not 'think along' too much.

The court of audit checked whether these recommendations had been followed. We concluded that the recommendations have been fairly widely taken up by the Ministry of Education, the education inspectorate and the institutions for vocational training. They have initiated various measures to prevent new problems with real estate, but they still have to take a few additional steps. Our message to the Ministry of Education and the education inspectorate is: don't stuck in the middle. It is important to repeat audits on real estate management themes, especially audits on internal checks and balances. We point out that unambiguous information in the annual reports is important,

Our message to the education institutions is to focus on early warnings, stress tests and on the insight in risks. Also improvements are to be made in the process of decision making like more involvement of the Supervisory Board

### **11.1.3. Analytical framework for real estate management**

The real estate audits of the NCA are based on an opinion about what good real estate management is. The NCA has developed a framework to value practices of real estate management. This framework is developed after an intensive consultation of the workfield and discussions with stakeholders (ministries, agencies, supervisors). In this chapter we describe briefly the elements of good real estate management.

Real estate management is the whole of activities aimed to realize financial and social goals with the use of real estate. The following elements are relevant for solid real estate management:

- a strategic real estate policy;
- a clear allocation of tasks and responsibilities;
- insight into the existing real estate portfolio;
- periodic assessment of proposed investments in new buildings, acquisitions and disposals in the light of the financial targets;
- effective progress monitoring to mitigate risks so that the cost saving target is achieved on schedule.

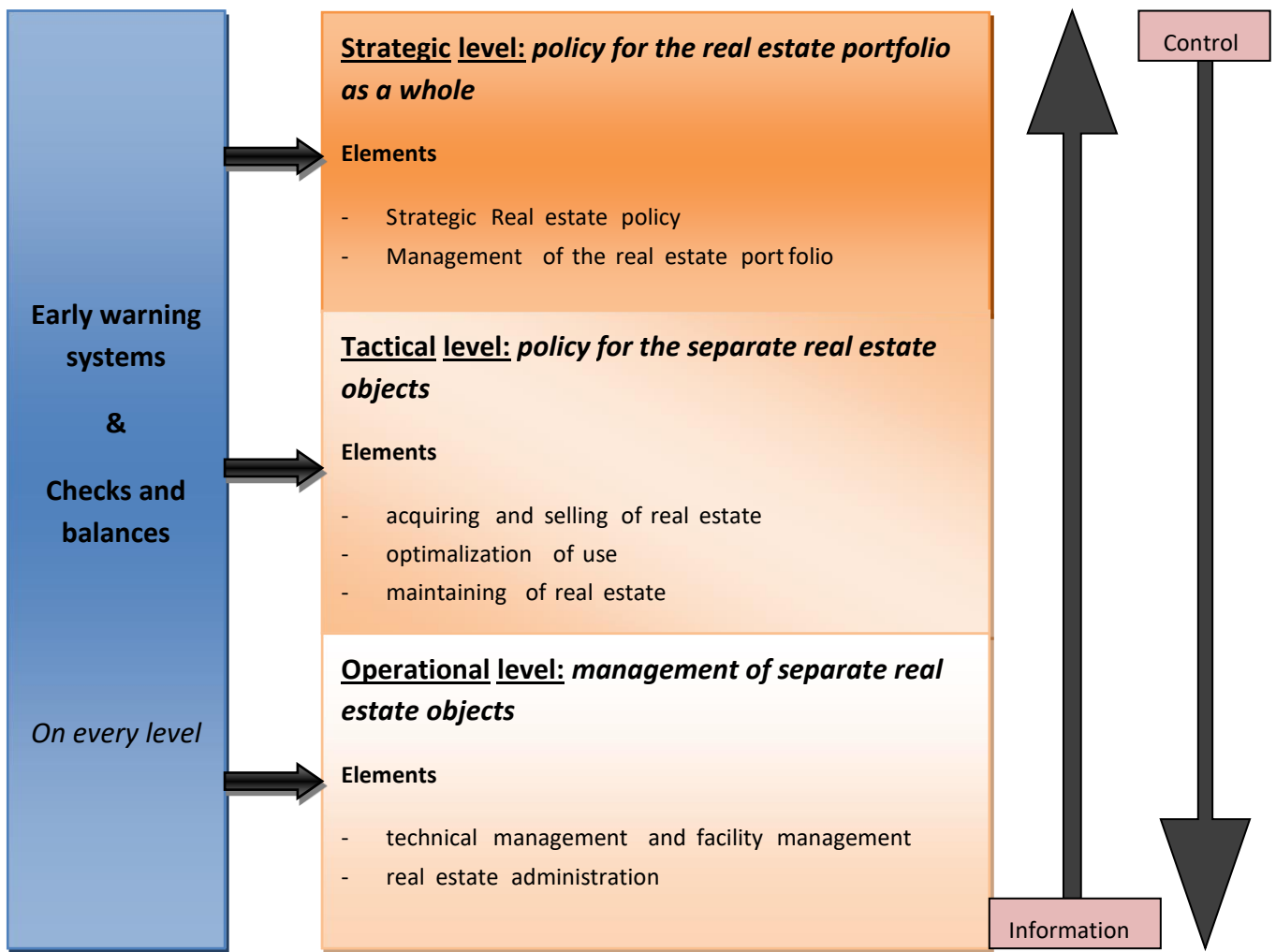
In the reports on the National Police, Defence and Universities, the NCA uses a management model analysis model based on three levels of real estate management:

1. At the *strategic level*, the organization determines its strategic real estate policy and its portfolio management. At this level, decisions are taken on the strategic core stock and the underlying levels are controlled. A good strategic real estate plan prevents ad-hoc decisions and includes a long term vision. This enables the organization to develop a solid and appropriate real estate portfolio, an optimized use of real estate and thus an efficient use of public funds in the longer term.
2. At the *tactical level*, object management takes place. The specific objects (e.g. buildings) are adjusted to the needs of the user. This alignment takes place within the frameworks that are determined at the strategic level. Object management includes decisions on the acquisition and disposal of real estate, optimizing the use and maintenance of the property in the portfolio. Ideally, real estate management at this level also includes incentives for an efficient use of real estate.
3. The *operational level* includes the technical and facility management and tracking of the property administration of specific objects. Good real estate management also requires clear agreements and assignments of tasks, responsibilities and competencies at each of these three levels. Between these levels are information flows that make it possible to make the relevant decisions at each level. Reporting at the strategic level should include, for example, cost of buildings and risks in the portfolio.

Finally, it is important that strong governance structures keep the strategic, tactical and operational management and control systems 'on track'. Early warning systems and effective checks and balances (for example, by a Supervisory Board, an accountant, a controller or an internal audit department) are crucial to protect an organization from mistakes and 'irresponsible adventures' with their real estate. Figure 1 shows this model of real estate management.



Figure 1: Model real estate management



Source: Algemene Rekenkamer, Vastgoed universiteiten, deel 1 Financieel toezicht op de sector, 2016.

Based on this framework and the studies discussed in section 2 we have developed a Guide to Basic Principles of Real Estate Management. This guide provides a framework and lines of reasoning that can help to improve the management and control of real estate projects at central government level and organizations at arm's length from the central government. The guide contains a number of general principles of good real estate management, provides a checklist for supervisory boards and contains a structure for a risk profile for real estate.

#### 11.1.4. Lessons from real estate audits

From the audits as described in section 3 and based on the analytical framework we discussed in the previous section the following six lessons can be drawn. We illustrate each lesson with one of more examples.

1. Beware that the quality of provision of information is in order on both system level and organisation level

Large cost-cutting operations (like the creation of the Central Government Real Estate Agency, CGREA) and transitions (like the creation of a National Police Force, NPF) arise from big ambitions concerning efficiency (CGREA) or savings (NPF). Our audits show that basic information on a high level is required. Reliable and sufficient basic information is necessary in order to find out whether the policy objectives are achievable and will be achieved, and also to be able to steer on effectiveness and efficiency of the real estate choices (like buying, selling, renovate and the choice between renting versus owning).

This means that decision makers must have a good insight in the current situation (the scope and value of the real estate, costs, profits etc.). It also means that they feature reliable information about the expected and realized efficiency-goals and the feasibility of their objectives.

Some of the audits described above (like the audits on the Central Government Real Estate Agency, Defence and National Police Force) show that the quality of provision of information can be improved. The audits showed for example that there is room for improvement concerning: the quality of the business cases, the information about achievability of costcutting, the information about actual risks and information about the progress that is made in the transformation process. In the audit of education housing the NCA found that essential basic information about the quality of the school buildings was lacking.

## 2. A long-term perspective is required

Our audits also show that decisions for buying or selling require a long-term perspective. A long-term perspective means that all costs that are expected for the next years are included. So, not only initial costs should be included, but also the yearly expenses for using the building and all costs of financing. In general the life-cycle-costings are higher than the initial costs (buying or selling) (Van den Dongen, Van der Sanden, Smaal, 2015).

In the audit of school buildings the NCA also emphasized the importance of the life-cyclecost approach for real estate. This approach makes clear that an initial investment can be very high, but that the costs can be earned back during the life cycle of the building.

In elaborating a long term perspective it can be helpful to make a business case in which the life-cycle-costs and profits of the building and a comparison between the costs of renting and buying are included. Such a business case enables the board of an organization to take better decisions concerning buying, renting, selling or renovation of the real estate portfolio (Van den Dongen, Van der Sanden, Smaal, 2015). The NCA emphasized this in the audits on the Central Government Real Estate Agency and the National Police Force.

In the audit of school buildings the NCA observed that keeping school buildings in a good condition is a long term matter, while the system provokes short term thinking and deciding. The way in which the responsibilities are organized between the municipalities and the school boards lacks a stimulus to include the complete life cycle costs of school buildings:

*“The system gives both parties the opportunity to keep the expenses low at the expense of higher expenses for the other party (the schools). Municipalities can do this by investing less in new buildings at the expenses of higher operating costs. These costs will be on the account of the school boards, and will be made in series of years – the complete life-cycle, which is approximately 69 years. In reverse, school boards can apply in their municipality for a building provision, without considering options who are more effectively for the municipality. Both money flows – for new construction and for maintenance – are payer’s capital. From a public interest perspective it would be desirable to consider both cost flows for new construction and for maintenance”.*

## 3. Ensure a balance between financial and social interests

The central government combines two roles: (1) owner of real estate and (2) guardian of the public interest. Both roles can be at odds. In its role as an owner the government wants to maximize the profit when selling real estate. But this financial argument sometimes interferes with the public interest. A social desirable re-destination of an office building can for example sometimes be less profitable from a financial point of view (NCA, 2015b; RLI, 2015 and Van den Dongen, Van der Sanden, Smaal, 2015).

It is important that financial and social interests are explicitly balanced against each other in order to serve the public interest and maintain sufficient legitimacy in the long term.

The central government’s opinion is that the additional costs for a social desirable solution must be financed by what he calls the “social carrier of the public goal” (Housing and the central government Sector, 2015). This is for example a municipality. In the opinion of the central government a fair price will be paid for released real estate, because there can not be any State aid (NCA, 2015b, page 32).

In practice the balancing between social and financial interests is often not transparent. When central government sells real estate it is not always clear who pays for the additional costs of a more expensive but social desirable solution.

In the audit of Defence real estate the NCA concluded that in its strategic real estate policy strategy the Ministry of Defence has made the choice that operational considerations should come in the first place, followed by financial considerations and finally the social considerations. Social considerations are no primary objectives of the Ministry of Defence. If the choice for a certain option is desirable from a social perspective but suboptimal from a financial or operational perspective for the Ministry of Defence, stakeholders should be willing to pay a financial contribution. The audit showed that the Ministry of Defence is aware of a possible friction between social goals and financial goals when selling real estate and also that the Ministry is transparent about the way in which financial and social benefits are balanced against each other.

4. Make sure that the organization features a solid real estate strategy in which the wider social context is integrated

In section 3 we have pointed out why a real estate strategy is important for public organizations. Such a real estate strategy should not only reflect the (financial, strategic and operational) interests of the organization, but also keep a wider social context in mind. In the audit of the Central Government Real Estate Agency the NCA recommended to the Minister to widen the Central Government Real Estate Portfolio Strategy to a semi-public real estate strategy per region (district) in which he also takes into account the real estate strategies of municipalities, care- and education institutions and other executive organisations.

About the real estate of the National Police Force the NCA noticed that though some improvements could be made (for example concerning the required expertise and the insight in realized savings), the social and financial goals in the real estate strategy of the National Police Force were sufficiently elaborated (NCA, 2016a, page 62).

5. Invest in risk management and make a risk profile

In the audits about the real estate of Defence, the school buildings and the universities the NCA emphasized the importance of risk management on all levels (strategic, tactical and operational). This is in the first place a responsibility of the organizations themselves, but the external supervisor can also play an important role in stimulating risk management.

Therefore the NCA advised the Minister for Education, Culture and Science (OCW) to create a better match between the financial supervision by the Education Inspectorate and the increased financial real estate risks for school boards. This could be done by paying more attention in the sector risk analysis to schools who are fully responsible for their school buildings (which is not always the case in The Netherlands, NCA 2016a, p. 13)

In its audit on the external supervision of real estate management by universities (NCA, 2016c) the NCA recommended to the Education Inspectorate – while classifying the universities in risk-categories – to make a risk profile for every university in which for example risk are included concerning governance, coming investments, financial key figures, estimated student numbers, the real estate costs versus real estate profits, the variety in income or the degree of flexibility (NCA, 2016c, page 32-33). The aim of such a risk profile is to get a good picture of risky combinations of specific risks. For example the combination of bad financial key figures and an urgent need for new real estate is such a risky combination.

6. Organize sufficient internal and external checks and balances

In the audit *University real estate (part 1)* the NCA pointed out the importance of detecting and correcting real estate risks and abuses in time. This makes internal and external checks and balances crucial to be aware that boards of organizations at arm's length from central government can take their responsibility for a solid real estate management (WRR, 2014 & 2015). Concerning internal checks and balances the role of the Supervisory Board is of the utmost importance. This Board should be able to determine whether the organization meets the basic principles of a solid real estate management. The Board should also intervene if necessary.

Besides the Supervisory Board, there are other important checks and balances like the accountant, the internal audit unit, the controller and the financial director. In the forthcoming publication – part 2 of the audit university real estate – the NCA will extendedly go into the role of the Supervisory Boards in practice.

The audit the NCA conducted on school buildings focused on the external checks and balances. The audit showed that it is difficult for municipalities to fulfil their controlling role. This is the consequence of limited information about the school buildings, given by school boards (NCA, 2016a, page 14). Due to this lack of information city councils cannot take well balanced decisions about the size of the housing budget. They are also able to determine whether goals have been achieved. This is at odds with the legal duty of municipalities to take care for good educational provisions (NCA 2016a, page 62).

#### **11.1.5. Finally: the importance of social and political support**

Even if the information provision is in order, and the organization connects the strategical, tactical and operational level in a satisfactory manner and there are sufficient checks and balances, the Board still can take decisions from a one sided organizational point of view and neglect the political and social context in which the decisions are taken.

In our view it is important that institutions who manage public real estate will do this in a way which can count on political and social support and is adapting changing social opinions (for example about sustainability) and needs (for example the need for other forms of living, education and care). This applies to both central government and public institutions at arm's length like care- of education institutions, with responsibilities for their own real estate decisions.

A strategy that takes into account social interests and which – like we described above – includes an explicit balancing between financial and social aspects, is the first step to maintain social and political support (legitimacy) for the long term.

In addition, if public organizations take their real estate decisions they should not only look to society in terms of demands and needs, but also in terms of social and political support or resistance. Real estate decisions – for instance the choice for “luxury and big” – might be justified from the perspective of the organizational interest. But these decisions sometimes cannot count on political or social support. Public institutions, how autonomous they may be, cannot close their ears for this.

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## 11.2. 10 Years of Barometer for Public Real Estate in the Netherlands

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In 2007, the Ministry of Housing and Spatial Planning took the initiative to issue the social building blocks: real estate for facilities. This has been the first attempt to deal with social real estate professionally as an asset. In 2008 the professorship of public real estate started with its first Barometer for Social Real Estate. In 2009, I advocated in Real Estate Magazine that research into social real estate is necessary from the perspective of Corporate Real Estate Management (CREM) through new development models and more (PhD) research.

In anticipation of the municipal elections of 2010, research by the research group Municipal Real Estate showed that social real estate was not a matter for the election programs of the political parties. This was a prelude to the funded RAAK subsidy application towards marketed municipal real estate for carrying out practice-oriented research. In 2012, this research led to the externally funded research group Social Real Estate. After that, the Social Real Estate professorship profiled itself in different areas. Extra media publicity has been generated primarily thanks to the attention of minister Stef Blok in 2014, when he received the first copy of the book *Barometer Maatschappelijk Vastgoed (Social Real Estate): Corporate Social Responsibility* at our annual congress, the round table meeting with State Secretary for Health, Welfare and Sport Martin van Rijn in 2015 and the informal conversation with the Minister of Education, Culture and Science Jet Bussemaker in 2015, as well as the many publications of the lectorate. The 2016 debate with civil society with the Prime Minister Mark Rutte when handing over the book *Barometer Maatschappelijk Vastgoed (Social Real Estate) 2016*, a round table meeting in 2017 with Minister of Home Affairs and Kingdom Relations Stef Blok, aldermen and directors Real Estate of Municipalities in The Netherlands, have contributed to social and economic knowledge utilization for future and existing real estate professionals. At the PROVADA 2017 we co-organized 'Shrink: Emptiness and Space for Innovation and Change' session, where the Minister of the Home Affairs and Kingdom Relations Ronald Plasterk presented his vision on this subject.

### 11.2.1. Social and economic knowledge

The societal and economic knowledge utilization of the Social Sciences research group has led to the fact that the theme is now fully integrated in the rapidly growing Real Estate & Estate Agency program at Hanze University Groningen and the Research Centre for Built Environment NoorderRuimte. The standard study book *Taxatieleer Vastgoed 2 (Valuation Real Estate)* for all higher professional education institutions in the Netherlands is also provided with a substantial chapter on the valuation of social real estate in 2015, in addition to the Innovation Workshops, the Honors Program, the Real Estate Lab and the NoorderRuimte Knowledge Center where many research projects with students have been successfully carried out. Other institutes such as the Amsterdam School of Real Estate, Odyssee University Brussels, KU Leuven, University Berlin, knowledge network Krimp Northern Netherlands, Fontys, HAN, University of Applied Sciences Utrecht have given many guest lectures and expert meetings. The published and sold-out books *Barometer Maatschappelijk Vastgoed (Social Real Estate)* in recent years are also used as study material.

Internationally, the professorship is present annually at the congresses of the European and American Real Estate Society (ERES) with articles and lectures. The lectorate is also represented at other international conferences. In the past two years, we have also explicitly focused on international publications, because social real estate in the Netherlands has a unique international position on property of the government, healthcare, education and housing corporations. This has led in particular to many international journal publications. What also contributes to the further professionalization of the Social Real Estate field is the collaboration in various studies of Prof. Peter Boelhouwer and Prof. Marleen Hermans of Delft University, focusing on earthquakes and professional commissioning at municipalities, and Prof. Erwin van de Krabben with PhD students from the research group, Annette van de Beemt and Dirk Kootstra, about, respectively, professional property management at Dutch

Municipalities and the funding system for primary education. We are currently working on the RICS accreditation for the Real Estate & Brokerage study that gives students access to the international RICS certificate and membership. The study has become the accreditation on March 28<sup>th</sup> 2018.

### 11.2.2. Research for 10 years of Barometer for Public Real Estate in the Netherlands

Over the years the Barometer for Public Real Estate (Veuger 2008-2016) has evolved from concise research reports on Public Real Estate to broad overviews of themes and trends in the area of municipal real estate, educational accommodation, healthcare real estate, and corporation real estate. The Barometers from 2008 to 2010 presented the research results of the Expertise Center VastgoedBeter of the Hanze University of Applied Sciences Groningen (as commissioned by the Social Real Estate Platform) and the Research Centre for Built Environment NoorderRuimte, Hanze University of Applied Sciences Groningen (as commissioned by the Social Real Estate Consortium). From 2011 on the Barometer is presented more explicitly from the perspective of the Lectorate for Social Real Estate. Since then, the Barometer has rapidly grown in size and diversity, and it now regularly creates an overview of current (graduate) research.

### Findings of 10 years Barometer for Public Real Estate in the Netherlands

*Table 1: Contributions for public real estate in the Barometer for Public Real Estate 2008-2016*

| #  | Year | # People | Topics                                                                                                                                                                                                                                                                                                                                                                                             |
|----|------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 2008 | 18       | Research into municipal real estate: real estate portfolio (types, quantity, quality); core tasks and organization; vision and policy, collaboration with market parties; future.                                                                                                                                                                                                                  |
| 2  | 2009 | 54       | Research into municipal real estate: follow-up of 2008; outsourcing of management and operation.                                                                                                                                                                                                                                                                                                   |
| 3  | 2010 | 16       | Research into municipal real estate: follow-up of 2008-2009                                                                                                                                                                                                                                                                                                                                        |
| 4  | 2011 | 77       | Trends and developments in social real estate 2011-2015. 9 contributions on research into municipal real estate, follow-up of 2008-2010; educational real estate; cultural real estate; new providers; outsourcing; sustainable operation.                                                                                                                                                         |
| 5  | 2012 | 161      | Vision and research. 14 contributions on lectorate on social real estate; municipal real estate, follow-up 2008-2011; vision and goals; professionalisation, performance measurement, benchmark for municipal real estate; the changing market; the role of various actors; real estate manager profile.                                                                                           |
| 6  | 2013 | 358      | Research and perspectives of social and financial return. 49 contributions on lectorate on social real estate; municipal real estate; educational real estate; corporations, healthcare real estate; innovation; technology; costs and returns; investments; value, valuation and value chains; sustainability and energy; actors; collaboration; knowledge exchange; reallocation; liveable city. |
| 7  | 2014 | 591      | Corporate social responsibility.<br><br>65 contributions on municipalities (including follow-up of 2008-2012); healthcare; education; housing corporations; corporate social responsibility; space and society; financial aspects; sustainability and energy; real estate management.                                                                                                              |
| 8a | 2015 | 301      | Part 1: Public real estate international.<br><br>32 contributions on municipal real estate (follow-up of 2008-2012, 2014); forerunners of municipal real estate companies, government real estate company; developments in social real estate; international research.                                                                                                                             |

|                  |      |     |                                                                                                                                                                                                                                                                                |
|------------------|------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8b               | 2015 | 170 | Part 2: Healthcare real estate international.<br><br>19 contributions on developments in healthcare real estate; valuation and financing of healthcare real estate; asset management for healthcare real estate.                                                               |
| 9                | 2016 | 514 | Research, trends and developments in healthcare real estate and municipal real estate.                                                                                                                                                                                         |
|                  |      | 282 | Part 1. Healthcare real estate.<br><br>26 contributions on developments in healthcare and healthcare real estate; healthcare real estate financing and investments; obligations; taxation and counting on healthcare real estate; asset management for healthcare real estate. |
|                  |      | 160 | Part 2: Municipal social real estate.<br><br>19 contributions on barometer and research results (follow-up of 2008-2014); developments in municipal real estate.                                                                                                               |
|                  |      | 40  | Part 3: Involvement of lectorate.<br><br>3 contributions on research into earthquake territory in Groningen; public sector asset management of university real estate.                                                                                                         |
| Total 2260 pages |      |     |                                                                                                                                                                                                                                                                                |

### 11.2.3. Future tasks in Social Real Estate

Looking at the future, there are two challenges that require attention. The first is the further valorization of the knowledge developed by the lectorate together with students, new and existing professionals, knowledge institutions in Innovation Workshops, Living Labs, Real Estate Lab, Research Centre for Built Environment NoorderRuimte, the recently started RICS Department of Social Real Estate, the RICS Department of Research & Innovation, Zorg Innovatie Forum (ZIF), a structural collaboration with NeVaP knowledge and innovation platform in the real estate sector (600 members), RICS Europe (125,000 members worldwide) and the accrued network of the Social Real Estate research group. International exchanges and publications in journals also have our ongoing attention. After a positive evaluation of the Social Real Estate lectorate in 2016, the lectorates for Social Real Estate and Real Estate were merged in 2017. The new assignment of the (Social) Property lectorate will therefore consist of two main themes: (1) Social Real Estate and (2) Viable real estate economy with disruption, blockchain and real estate. The second theme started at the Noordelijk Real Estate congres 2017 on 12 October, an initiative of Villa '96 – the student association for Real Estate & Brokerage study – and the lectorate (Social) Real Estate.

The second challenge is the new challenges for social real estate that come from the publications as experts have now looked at the Barometers of Social Real Estate in the past 10 years. A number of challenges are as follows (10 years of Barometer for Social Real Estate 2017, Veuger et al 2017: 5-8):

- We think it is important that organizations that manage public real estate do so in a manner that can count on political and social support and that adapts to changing social attitudes (for example, about sustainability) and needs (e.g. other forms of housing, education and healthcare). This applies to central government and also to public institutions that can make real estate decisions with a large degree of autonomy, such as healthcare or educational institutions (Montfort, van der Maas, Noort-Verhoeff and van der Zanden, 2017).
- Almost all municipalities work on the professionalization of their commissioning role and, for example, carry out pilots with new forms of cooperation. They recognize the need for a better securing of knowledge about new forms of commissioning, because they are faced with a strong, dynamic market in this area. Competency development is one of the most obvious jumping themes (Hermans, Huizing, Amesz and Veuger, 2017).



- The most important current challenges for the municipal real estate portfolios are making the entire property portfolio more sustainable. The impact of the rapid technological developments and the increasingly strategic role that municipalities demand on the basis of the principle 'back to the core tasks' (Wildenberg, 2017).
- The distinction between sector-specific and more generic knowledge, data and learning points is an important point of attention (Voort, 2017).
- Seen in this way, there are indeed opportunities for taking on the sustainability of educational accommodation in the short term. This does not alter the fact that the funding of new construction in the PO and VO falls short and should be reformed (Postema, 2017).
- The question I think seems to be how organizations in social real estate can combine the advantages of small organizations with the purchasing and expertise benefits of larger-scale organizations (Koolma, 2017).
- A related question is that of the trade-off between outsourcing and in-house management. Which combination of activities yields added value? (Koolma, 2017).
- It would be better if there were separate measurements to estimate return on investment and social return on investment. However, measuring social real estate is still in its infancy (Koolma, 2017).
- Furthermore, I would like to argue for more research into how administrators, managers and frontline workers make their decisions regarding social real estate (Koolma, 2017).
- In order to regain control capacity (in the care for the elderly) or to not lose capacity (education), without going back to supply management as it was, there are two options. First, strengthening the spatial track, for example by means of an environmental vision (drawn up by cooperating municipalities) on the facilities structure and in connection to the housing vision. Second, by sectoral funding as the starting point for spatial control, but in a new way, as is the case with the decentralization in education (Tennekes, 2017).
- The quality of real estate and facility management will be able to further improve (even) more
- to carry out high-quality research in which the added value of real estate and facilities for users and owners can be demonstrated even better (Mobach and Himmans, 2017).
- The experiences from the first year of the municipal benchmark effectively form a roadmap for digitization and integral real estate management (Jansen 2017).
- To be able to think in an efficient and effective way about the challenges resulting from demographic transition and selective migration patterns (facilities, mobility, housing, heritage, etc.) a cognitive shift is necessary. From thinking about a complete core to thinking about a complete region (Bulder 2017).

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### 11.3. Wooneconomie Ede door verbinding van energie en zorg

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#### 11.3.1. Samenvatting

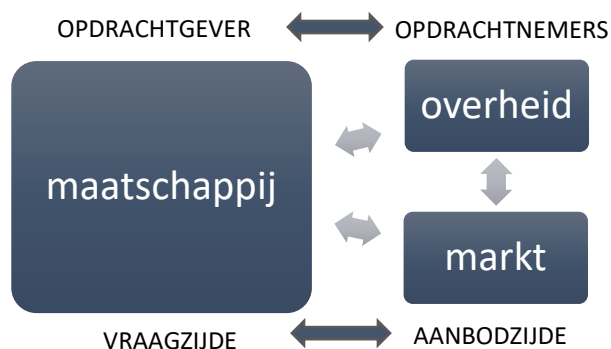
De samenleving is volop in transitie (Rotmans 2012, 2017). Hoewel er vele veranderingen ten gevolge van transitie zijn, spelen voor het wonen de volgende ontwikkelingen een belangrijke rol voor gemeenten en in het bijzonder voor gemeente Ede: (1) verdichting, (2) zorg in de wijk en langer thuiswonen, (3) energietransitie en (4) burger en participatiemaatschappij.

De gemeente Ede wacht, vooral ingegeven door huishoudensverdunding en groei (Ede, 2015), een aanzienlijke opgave voor het beschikbaar hebben van nieuwe woningen (MPG Ede 2018). De toekomstige opgave ligt vooral in de bebouwde kom door enerzijds door landelijke regelgeving - De nieuwe ladder voor duurzame verstedelijking (Heijde, 2017), anderzijds omdat Ede de groene leefomgeving hoog waardeert (Ede, 2015). Inbreiding en transformatie van gebieden en gebouwen betekenen meer complexiteit, verdichting en meer druk op de financiële businesscases. Wetgeving zorgt ervoor dat ouderen langer thuis wonen, waardoor voorzieningen nodig zijn in en om de woning en de leefomgeving. De bewoner is nu steeds meer verantwoordelijk om eigen zorg te organiseren (Doorten, 2017). Vrijwel tegelijkertijd is de toenemende druk ontstaan om de samenleving energieneutraal te maken evenals de impact van de 17 speerpunten van de Sustainable Development Goals (United Nations, 2015). De gebouwde omgeving energieneutraal maken is noodzakelijk om deze klimaatdoelstellingen te behalen. Ook de gemiddelde burger komt steeds voor zijn rechten op, weet de juiste routes te vinden en wil meedenken en beslissen. De overheid stimuleert participatie (Broek, Steenbekkers, van Houwelingen en Putter, 2016), maar worstelt met rolneming en de uitvoering.

#### 11.3.2. Organisatie als antwoord

De gemeente Ede handelt zo goed mogelijk in het maatschappelijk belang van de lokale samenleving. Hoe moet de gemeente Ede reageren op de veranderingen, wetende dat veel veranderingen nog moeten komen en dat we pas aan het begin staan van een aantal transitie waarvan we de uitkomst en route slechts beperkt kunnen voorspellen? En wetende dat zonder innovatie en slimme verbindingen de doelstellingen voor bijvoorbeeld het klimaat onvoldoende te financieren en te organiseren zijn.

We moeten onderkennen dat deze doelen en geldstromen zich richten op hetzelfde domein bestaande uit (1) de bewoners met (2) hun woningen en een (3) bijbehorende economie. Met andere woorden: de ruimtelijke wooneconomie van het collectief van bewoners binnen de gemeentegrenzen en deze geldstromen beïnvloeden deze wooneconomie en zijn dus met elkaar verbonden.

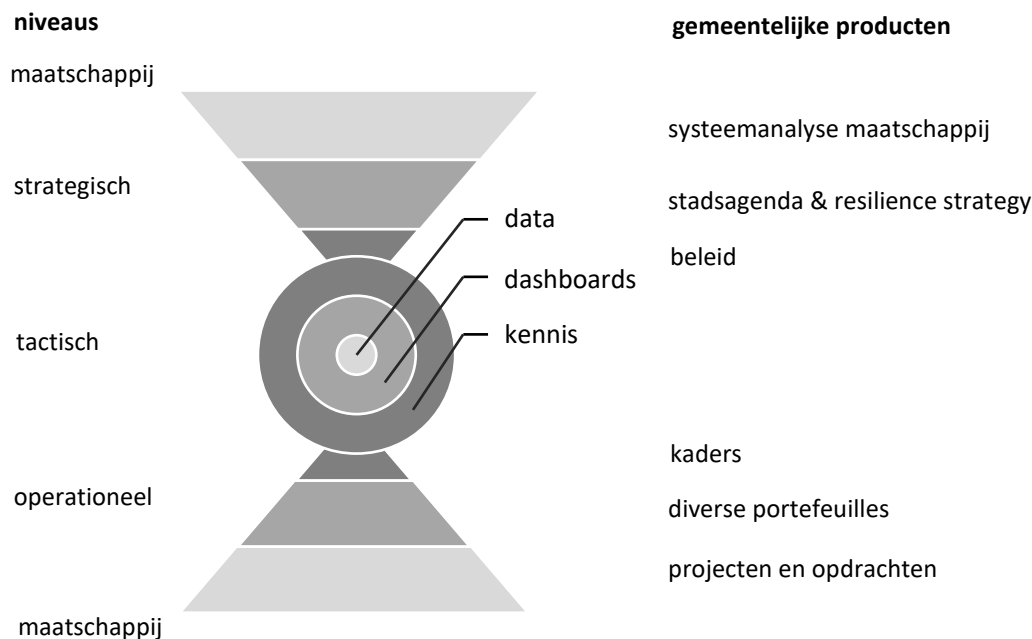


Figuur 1: driedeling, met overheid en markt als opdrachtnemers

Beseffende dat het domein Wonen breder te definiëren is, komen ook andere stakeholders in beeld of de bekende spelers op meerdere onderdelen tegen. Veel van die partijen zijn langdurig verbonden aan Ede. Naast woningcorporaties en beleggers, zijn dat ook netwerkbeheerders en zorgpartijen. Deze investeren langjarig geld in diverse assets in de ruimtelijke economie en staan voor eenzelfde transitieopgave. Hier liggen kansen voor

nieuwe maatschappelijke businesscases. Zo heeft de netwerkbeheerder belang bij een energietransitie waarbij het netwerk zonder extreme pieken en dalen belast wordt.

Ook al verandert de maatschappij snel en moeten organisaties zich inspannen om hun toegevoegde waarde opnieuw uit te vinden - met dat het maatschappelijk belang voorop staat - is een vaste waarde in de koersbepaling. Voor de gemeentelijke organisatie betekent dat diverse onderdelen weer moeten stilstaan bij hun toegevoegde waarde en actief nieuwe (interne) verbindingen aan moeten gaan. Samenvattend is te stellen dat Ede het maatschappelijk belang met een samenhangende, duurzame veerkrachtige gemeente moet bewerkstelligen: een resilience strategy waar alle maatschappelijke thema's uit voortvloeien. Figuur 2 geeft een structuur die daarbij een richting geeft.

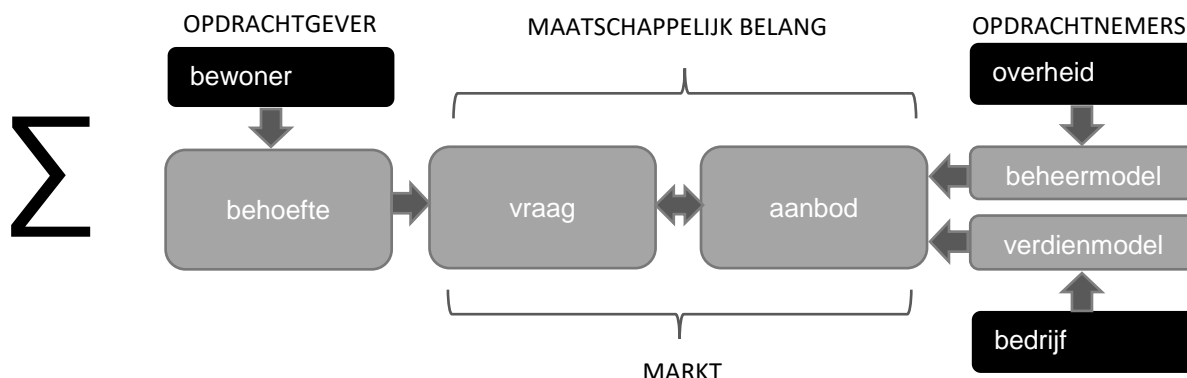


*Figuur 2: structuur en producten gemeente op diverse niveaus*

### 11.3.3. Stadseconomie als hulpmiddel

Economie gaat over de wensen van mensen en hoe ze proberen die wensen te vervullen. Het gaat om de behoeften en de manier waarop daarin wordt voorzien. Letterlijk betekent het huishoudkunde. Stadseconomie is huishoudkunde op stadsniveau. Het gaat over de woon- of buurteconomie van Edense inwoners. Hoe kan de gemeente Ede de (publieke) middelen effectief en efficiënt inzetten om duurzame maatschappelijke impact te generen voor de inwoners (en ondernemers) van Ede? En hoe kunnen we deze impact organiseren en financieren via de ruimtelijke economie?

In figuur 3 is het klassieke economische principe van vraag en aanbod weergegeven, wat samen de markt vormt. Voor de ruimtelijke wooneconomie zijn dit de traditionele woning- en grondmarkt, maar nu ook aangevuld met in ieder geval de thuiszorg- en energiemarkt. Achter de vraag zit een behoefte, afkomstig van de individuele (toekomstige) bewoner. En achter het aanbod zit een verdienmodel van een marktpartij en een beheermodel van de overheid. Het sommatieteken links staat voor het feit dat het meervoudig is: er zijn meerdere bewoners en die hebben steeds meer samengestelde behoeften. Essentieel in dit model is dat de markt het maatschappelijk belang moet dienen.



Figuur 3: figuur 1 gecombineerd met klassiek economisch model

Gegeven het vraagstuk wonen, inclusief zorg en energie en hoe de gemeente de middelen zo effectief en efficiënt mogelijk in wil zetten, komen een aantal van belang zijnde punten naar voren:

- (1) Bewoners, bedrijfsleven en overheid zouden moeten handelen in het maatschappelijk belang voor het behalen van klimaatdoelstellingen. Wie bepaalt de Edense agenda?
- (2) Behoeften werken soms tegen elkaar in. Zorg vraagt om domotica en verhoogt de energievraag. De huishoudensgroei ook, wat ook weer extra zorg met zich meebrengt. Hoe borg je de samenhang?
- (3) Hoe houd je deze maatschappelijke markt toegankelijk voor iedereen?
- (4) Welke randvoorwaarden zijn er om de schaarse middelen, ruimte en geld het beste in te zetten en wat geeft het beste maatschappelijke rendement?

Om met Stadseconomie te werken vraagt dit om een holistische kijk vanuit het perspectief van ruimtelijke economie te kijken, zodat de vraagstukken op een ander hoger abstractieniveau kunnen worden opgelost. **Wat is goed voor Ede en wat kan stadseconomie daaraan bijdragen?** Vormt de centrale vraag in deze discussie paper. Voor de uitwerking van deze discussie paper zijn een zestal doelstellingen te benoemen:

- (1) zorgdragen voor de het zuinig en duurzaam inzetten van ruimte voor de stadsagenda en bijbehorende veerkrachtige stad: resilience strategy;
- (2) borgen van de continue betaalbaarheid van wonen, zorg en energie, en in een ander stadium klimaatadaptatie, food en mobiliteit;
- (3) zorgdragen voor inclusiviteit zodat iedere bewoner de kans krijgt om te participeren en niet wordt uitgesloten vanwege een niet draagkrachtige financiële situatie. Verbeteren van de collectieve economische situatie;
- (4) zo effectief en efficiënt mogelijk inzetten van gemeentelijke geldstromen in de ruimtelijke economie;
- (5) de afdeling Grondbedrijf inzetten als maatschappelijke investeringsvehikel; en
- (6) uitwerken van maatschappelijke businesscases om impact te creëren op de markt en investeringsmogelijkheden te creëren voor bewoners en bedrijven.

#### 11.3.4. Uit te werken oplossingsrichtingen

##### I. *Anders economisch denken*

Wat zijn de behoeften en hoe gaan we daarin voorzien, gegeven de druk op de ruimte, de financiële middelen, de veranderende doelstellingen? Als de bestaande stad als basis is, wat kun je daar voor elkaar krijgen en dan pas kijken wat nieuwbouw kan oplossen. Cyclisch denken, verbinden van ideeën, beleidsvelden, stakeholders. Welke geldstromen zijn op een logische wijze te verbinden? Denken als een belegger: wat is goed voor de *lange* termijn en wat maakt het *nu* interessant om te investeren? Welk rendement willen we behalen? Belangrijk is dat dit denken op zowel strategisch als tactisch niveau samenkomt, zodat de operationele activiteiten van goede kaders zijn voorzien. Bij dit stads economisch denken passen sleutelwoorden als: collectief, arrangementen, bewoner centraal stellen, buurtniveau, slimme businesscases met voldoende voordelen alle stakeholders, partners zoeken, gronden en gebouwen inzetten. Een economische infrastructuur bieden voor maatschappelijke initiatieven.

## II. *Digitalisering en beschikbaarheid van data*

Digitalisering en beschikbaarheid van data (Veuger 2017) wordt een steeds belangrijker sturingsmechanisme. De hoeveelheid aan informatie is exponentieel toegenomen. Deze data is nog niet altijd goed verbonden en ontsloten. Toch zet deze trend zich door, waardoor meerdere partijen toegang hebben tot dezelfde informatie, zoals die van het kadaster en het CBS. Voor geschikte methodes wordt gekeken naar bijvoorbeeld blockchaintechnologie. Maar ook op eenvoudige manier data koppelen, zoals nu gebeurd is bij het Integraal Portefeuillemanagement Wonen (IPW). Door de dat op tactisch niveau te koppelen (figuur 2) en daar meerdere disciplines en afdelingen naar te laten kijken is er samenhang ontstaan tussen het beleid vanuit Wonen, levendig centrum, de portefeuille van het grondbedrijf, maar ook het toelaten van nieuwe initiatieven en de prognoses van de provincie. En door op modulaire wijze bijvoorbeeld data over energie (verbruik, prijzen en labels) toe te voegen ontstaat een nieuwe synergie. Belangrijke sleutelwoorden zijn hierbij: evidence based, modulair en holistisch.

## III. *Gebruik van eigen grondbedrijf, vastgoed, expertise en vaardigheden*

Stel andere doelen, die direct aansluiten op de stadsagenda, bijvoorbeeld jaarlijks zorgen voor 50 nieuwe arbeidsplaatsen in plaats van een hectare per jaar grond verkopen. Dan is het mogelijk om te sturen op zuinig ruimtegebruik. Zo vorm je het grondbedrijf opnieuw tot een maatschappelijk investeringsvehikel, waarbij de rendementen anders terugkomen dan in de vorm van winst op de grondexploitatie. Benut daarbij de huidige kennis en competenties en vul deze, misschien via vallen en opstaan, aan. En zorg voor een wendbare organisatie: over een paar jaar kijken we weer anders tegen alles aan.

De dialoog moet in Ede nog gevoerd worden. Hiervoor zijn een brainstormsessie en klankbordgesprekken gepland. Dit zal richting geven aan een afdelingsplan Grondzaken en Vastgoed. In de nota Grondbeleid (Ede 2016) is aan de gemeenteraad toegezegd om het begrip stadseconomie voor Ede uit te werken. Deze discussie paper is bedoeld als verkenning en voorbereiding daarop.

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#### **11.4. Industry as a Service in 2050: Dutch municipal real estate organization as a matchmaker**

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##### **11.4.1. Abstract**

This paper explores the potential impact of “Industry as a service” and how this will influence the real estate market and municipalities in particular. This concept implies no ownership of the real estate, but only ‘pay per use’ principles. We explore how municipalities could utilize such services to contribute to their (policy) goals and manage risks. Key aspects contributing towards (policy)goals and managing risks are effectiveness and efficiency. Furthermore, this paper explores the expected role of Dutch municipalities in 2035-2050, how municipalities go about such practices and we question the need for a real estate organization if real estate products are commercial and leasing is based on space utilization and duration. Subsequently, we explore the challenges such implementation would instigate – i.e. change of firm culture - and what the changes would yield. This research proposes Dutch municipalities to consider the future implications to instigate changes to current practices. Key components such as flexibility, strategic steering, sustainability, big data and Blockchain will need to be considered in the process of strategic portfolio management. In addition, this study suggests the future role of municipal real estate manager as ‘matchmakers’ and argues that Dutch municipalities should already start to explore this role for a successful implementation by 2050.

**Keywords:** Industry as a service, Future municipal Real Estate Management (MREM), Circular economy, Blockchain

#### 11.4.2. Introduction

Much has been written on problems of the current (linear) economy and as a result have challenged the current economic system. This paper is positioned to look ahead beyond today and exploit the days of tomorrow. The linear economic model is no longer sufficient with the increasing demand and overpopulated planet Earth. Concepts such as “Circular Economy”; “Industry as a Service” have increasing merit to revolutionize the current systems and practices. The purpose of this paper is to summarize an angle of approach that provides insight in the possible effects on the way municipal real estate could be managed in 2050.

##### **Sketching a picture of 2050:**

To sketch a ‘Star trek’ alike picture of 2050: we imagine a high-tech city full of autonomous flying cars in which inhabitants are constantly on the move from A to B. When entering a retailer, the product you desire is immediately disposable to you; instantly at your service. Information is perceived by numerous cameras and sensors and processed by artificial intelligence into a fully automated society: from transportation to the desired multimedia broadcast to the cooking of our meals and to the dismantling of all operational and tactical actions which we carry out in our daily work activities in 2018. What remains is the focus on mainly strategic issues; the translation of the why-question into activities. This is in line with the current transition/ movement set into motion by Dutch municipalities to focus on core activities (that will remain regardless of time) and explore the potential role as a ‘directing authority’.

The afore mentioned sketched virtual reality will have major impact on the way in which municipal real estate is managed and operated in 2050. Subsequently, this will affect the way in which municipalities’ real estate organizations will be organized. It is our prediction that in 2050, municipal real estate organizations will have become well-oiled ‘matchmakers’ between the demand for social housing on the one hand and strategical physical supply solutions on the other.

This is an explorative literature study where the impact is described on Dutch municipalities and how they could (re)position themselves in order to accustom for the rapid technologic and industrial changes that will transpire towards the year of 2050. It is our understanding that in the future key components such as flexibility, strategic housing steering, sustainability, big data and Blockchain will be integrated in an overarching new economic model. In addition, cost based pricing methods will no longer be an issue as it will be standardized and integral of the leasing product, proposed in the new economic model. Blockchain is considered to play a vital part in the reliability and transparency of transactions and payment methods.

##### **2050: Different world due to disruptive innovations from technological developments**

The concept of disruptive innovation (Christensen, 1997) has received much attention from both academics and practitioners. Disruptive technological innovations eventually grow to dominate the market are disruptive to established competitors as new products are created by new comers. Radical innovations are disruptive as they introduce products and value propositions that disturb prevailing consumer habits and behaviors in a major way (Markides, 2006). In addition, disruptive innovations are usually introduced by new comers (Tushman & Anderson, 1986) and create major challenges for incumbents which is especially important to consider in the real estate industry as typical real estate investments have a long time horizon (Mackinnon & Al Zaman, 2009; Manganelli, 2015). Additionally, real estate is considered to be a highly inflexible resource (Gibson, 2000, p. 150). However, the markets are becoming more volatile, due to greater demands and therefore the need to respond to those demands in agile ways is becoming much greater (Cannon, 2017, p. 3).

Technologic developments are becoming more and more relevant and needed to increase flexibility of the tangible asset and starting to have great potential impact on the real estate industry. Previously, real estate tech companies focused on updating legacy systems for property management in commercial real estate and aggregationplatforms, currently the real estate market is becoming more filled with tech companies tackling larger problems (CB instights, 2018). This trend is highly stimulated by crowd funding and venture capitalists as these startup propositions prove to be very lucrative. Moreover, a study by United Nations Department of Economic and Social Affairs (2017) shows an exponential increase of investment volume in Artificial Intelligence (AI) over the recent years (figure 1). Technologies such as 3D printing, autonomous automobility, ‘the era of unbuilding’, smart building solutions, flexible uses of real estate and the large-scale application of Big Data are just a few examples.



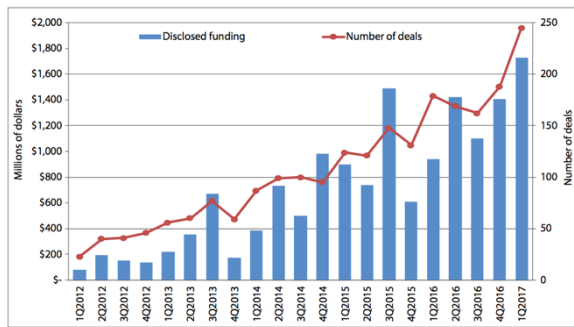


Figure 1. artificial intelligence funding (millions of dollars) and number of deals. CB Insights, 2017; (United Nations Department of Economic and Social Affairs, 2017)

It is imperative that with every investment decision, a real estate manager must take into account the state of these developments at that all times. Consequently, municipal real estate managers have to take this into account in their decision-making processes and must make careful assessments of which innovations to give a place and which are not sufficiently developed or simply not relevant (yet) to the municipal real estate portfolio. In addition, the speed of technological innovation demands an 'outside-in' thought process in order to periodically consider the appropriate innovations. The most important developments for municipal real estate managers to consider is the change from ownership to usage. Meanwhile, municipal real estate managers should consider the development to smart and connected buildings for smarter maintenance programs. Moreover, they should consider the application of Big Data for supply and demand studies relating to the provision of social services. Furthermore, the development of autonomous vehicles will be disruptive for cities causing mobility patterns to change, shifting the demands for different infrastructures.

In addition, the development of technology also impacts transparency levels – for instance Blockchain allows transparent tracking of transactions). As this becomes more widely available, the public will demand more and more transparency. Therefore, Dutch municipalities will have to adopt similar technologies in order to satisfy societal needs – especially since public real estate requires significant public funding (mostly originating from tax payers' money) – and need to be spent effectively. The 'Industry as a Service' using a circular economic approach could provide an answer for Dutch municipalities.

### The city as multifunctional office

We interpret the city of the future as an office, where space is widely available for all cities' inhabitants. All available spaces are logged and instantly available in a futuristic Application (mobile App) that offers total flexibility. The payment system uses a 'pay-per-use' system where 'trackers' keep track of the duration of facilities' usage – therefore is up-to-date and can represent current heat-maps of high demand areas. This information offers direct insight into supply and demand ratios, on which the system automatically adjusts price rates. For instance: High demand in city center results in lower (rental) rates in the periphery of the urban area. This stimulates mobility in the city. However, requires a certain scale of infrastructure and faster transportation within the urban agglomeration to accompany this increased mobility demand.

### Urban politics translated directly into specific actions

Political demands – for instance , encouraging inhabitants to exercise to improve health conditions – could be facilitated by the use of smart technologies and applications. To illustrate using the exercise example: through usage of such smart technologies inhabitants could pay for facilities using a budget, or could be discounted for certain sport facilities. Not only can this be seen as a motivator, the city can instantly check the effectiveness of instruments and measure performance of their ambitions. Another benefit is the integration by means of transportation: "if you go by bike you will receive an additional 25% discount", facilitating motivation that could in turn save millions on healthcare expenses.

### Social use

We expect this approach for facilities to be applicable for social users and target groups. We expect the real estate organizations of Dutch municipalities to focus primarily on strategic aspects in the future; translating the demand from policy services to space requirements efficiently and effectively. Smart tools measure usage and

provide instant feedback. Moreover, such smart tools can be integrated in automated standardized reporting processes. It is our expectation that in the future social user groups receive a budget based of size, requirements, etc. - approved by the city council - and can be spend wisely using the app by choosing cheaper locations. This in turn provides optimal usage of real estate and allows management to actively opt for a minimum required portfolio. Furthermore we believe that in future, buildings will no longer be mono-functional and that by implementation of smart technologies instantly transform into specific spaces; tailored for each user requirement.

### 11.4.3. Literature review

#### Industry as a service: a circular approach

Circular economy is based on the natural imitation of 'cradle-to-cradle' instead of 'cradle-to-grave' (Bermejo, 2014). The focus area is on the use of recycling, materials and producing energy from natural sources. Moreover, providing services instead of products and focusing on a society without waste. A definition of the circular economy is given by Ellen MacArthur Foundation (EMF, 2013):

*“circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.”*

The functionality of a circular economy is based on a principle (figure 2) in which material flows are iterative loops. Used products are the resource of another by designing in a way that allows full recycling given that society provides infrastructure capable of processing this (EMF, 2013; Bermejo, 2014). Moreover, There are a number of axioms within CE thinking ((Mohammadi et al., 2015, Ploeger, Prins, Straub, & van den Brink, 2017):

1. Renewable energy (such as sunlight, wind, waves and geothermal energy) is used and that this energy is sufficiently available and respects general principles of sustainability.
2. the prices of raw materials will rise, due to world population growth and the increase in prosperity. The recycling of raw materials is therefore the most economical solution.
3. All other materials and products (raw materials) are expected to continue to circulate continuously (multi-cyclical behavior) in technical loops.

#### WHY? CE TCO principles

The economic perspective of circular economy is mainly defined in the concept of 'service provision' (EMF, 2013). This means that customers only pay for services and producers retain ownership of the materials within the products. Scholars argue that this approach will benefit the economy as a whole (EMF, 2013, Bastein et al., 2013). However, it is imperative that pricing is determined using a 'Total Cost of Ownership' (TCO) approach. TCO has a wide range and includes purchasing costs of a particular supplier. Moreover it includes life cycle costing, which are mainly focused on capital or fixed assets (Ellram, 1995). In short, it will be fully transparent how much the provision of services will cost the municipality per component. In addition, using smart technologies such as Blockchain enhances transparency in transactions and keeping track of materials, establishing trust in the real estate sector. Further elaborated in paragraph regarding Blockchain.

#### Why applicable for municipalities?

Separating functional use of a product and ownership can have great positive impact on municipalities. Not only allows this for a greater focus on core tasks, but it liquidates capital that can be utilized to achieve social objectives. By paying for the services provided (including use, monitoring and maintenance), this unburdens the municipalities' real estate organization of responsibilities and costs. Despite the governments possibility to attract cheaper loans, costs of the 'as a service approach' will be lower due to the scale and therefore higher level of efficiency can be achieved. Moreover, smart collaboration with the market brings feasibility closer and facilitates a strategic municipal role. The most common payment methods for such services provisions are 'Pay-per-use' and operational leases (Ploeger, Prins, Straub & van den Brink, 2017). This kind of disruptive thinking has already been embraced by large companies such as Philips (Sustainable Lighting, 2018) and it will greatly benefit Dutch municipalities to go along with this transition. In addition, Dutch municipalities are often seen as lagging behind on market developments, by means of paying for 'lean' services allows them to benefit

technological developments without intensively investing capital. This also allows management to focus on adding value instead of an operational focus.

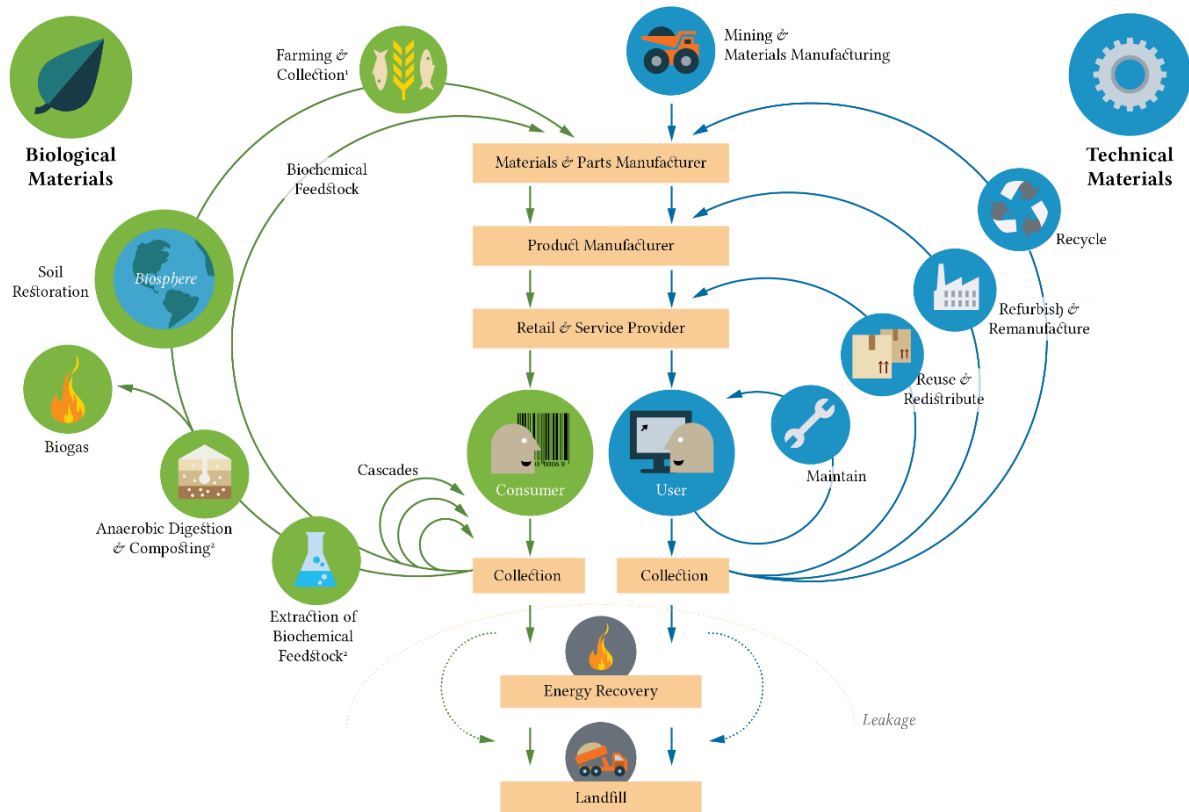


Figure 2. The principle model of a circular economy. (EMF, 2013)

Currently, Ploeger et al. (2017) concludes that the circular model still has legal issues, but we expect all of this to be resolved and the circular model to be fully applicable and widely implemented within the real estate industry by 2050.

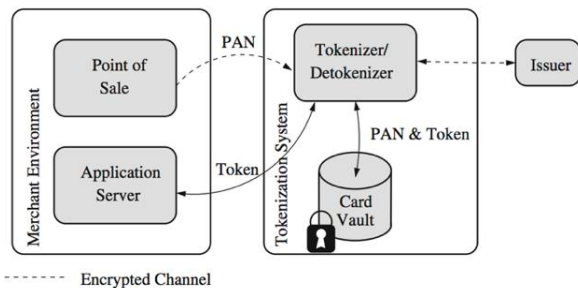
### Blockchain: CE applications

Blockchain is an open, peer-to-peer (shared) log of transactions (Shedroff, 2018). This log is distributed and supported by everyone's systems and therefore there is no central agent. To authenticate a transaction, more than one node must be present, otherwise the transaction will not be added to the log. As soon as the block (the transaction page) is filled, it is permanently recorded and cannot be changed after verification. In short, every transaction can be requested, creating a new kind of transparency that will affect the real estate sector. The use of Blockchain allows to merge information regarding real estate properties and provides access to parties in need of this information. Blockchain has a huge impact on the value chain of real estate with regard to efficiency, transparency, ownership, value (transfer), automation and services (Veuger, 2018). In essence, Blockchain can be an ideal way to register transactions of materials and services in a circular economy.

Another possible application of Blockchain is self-managing contracts. Blockchain technology is controlled by a software code called 'smart contracting'. If the system is designed correctly, it can manage itself using a self-managing code. This would enable blockchain technology to manage its own transactions at the touch of a button – destressing the municipal real estate organization significantly. Moreover, it allows easy access to all reports on every transaction of all materials in the building regarding: repairs, appraisal estimates, tax assessments, construction documents and sales transactions (Shedroff, 2018) at the touch of a button. Thus, operational tasks such as contract management become surplus. As a result, Blockchain can significantly reduce the size of the real estate organization.

### Ownership municipal real estate by inhabitants

In addition to all the advantages for municipalities, Blockchain allows inhabitants to become (partly) owner of social real estate. Given that real estate ownership is not a core activity of municipalities, we argue that in the future the property may be owned by the residents. This can be implemented using 'Tokenization' system as displayed in figure 3. This is breaking a series of strings into pieces such as words, keywords, phrases, symbols and other elements called tokens (Santiago, Henriquez, & Chakraborty, 2016). We would like to make a leap into the deep-end and use Tokenization as a means to fragment the ownership of current social real estate. Daily traded via using Blockchain technology and a cryptocurrency.



Figur 3. Architecture of the tokenization system (Santiago, Henriquez, & Chakraborty, 2016)

### Impact on Dutch municipalities' real estate organisations

The Industry as a Service (IAS) and CE principles will have great impact on current problematics. For instance, sustainability issues will be discussed by making strategic tradeoffs and Dutch municipalities will pay for the use of service deliveries. Since municipalities will no longer be owner of their real estate, they can choose the various services to purchase to achieve sustainability objectives. For instance, given that in 2023 municipal office portfolio needs to be compliant with an average Label-C (VNG, 2017), municipalities can choose to lease a real estate product that is already compliant with these demands.

Embracing the 'Industry as a Service' (IAS) and CE principles optimally facilitates behaving like a director of the city. 'Matchmaking' is the most important role regarding housing social users. Facilitated by the well developed technology as mentioned earlier, this role is strictly strategic: does the supply meet the demand both quantitatively as qualitatively and what needs to be done to improve this when the technological system fails? It means letting go of ownership and with that letting go of current apparent certainties, such as 'grip'. Developments like the coming of the 'environmental law' will empower municipalities to reach their urban development goals in urban areas in consultation with the area stakeholders without having any ownership.

Other current issues that requiring strategic focus are the implementation of cost-covering rent (TCO approach) and outsourcing of some tasks or even of the entire social portfolio. Implementation of the cost-covering rent requires, in addition to insight into the financial impact for the individual properties and the portfolio as a whole, integral support within the municipality at the Policy Departments, Real Estate and Control. It requires a municipal vision on the location of the real estate in the municipal business process and the way in which costs should be allocated, calculated and the way value of real estate should or should not play a role.

### Flexibility:

In addition, there is the quest for flexibility; both in terms of management and real estate portfolio. Firstly, the issue of dispositioning surplus real estate must be addressed. The question of which real estate should and should not be sold requires strategical guidance. Once that choice has been made, several sale strategy can be set up via various channels: real estate agents, internet auctioning, and 'sales in dialogue' for special or complex objects where the social development of the neighborhood is paramount.

Secondly, organizational flexibility is required. Gibson (2000) argues that to accommodate for the fast pace of change in organizational needs, real estate needs to become more flexible and therefore looking at alternatives to overcome municipalities inflexibility is fundamental. In addition, it is explained that flexibility assessment is vital in understanding strategic capabilities and organizations increasingly look at ways to become more responsive as, the pace of change increased due to technological innovation, global competition and

restructuring of political economies. Management initiatives such as downsizing, delaying, outsourcing, business process re-engineering (BPR) and core focus have been used to gain greater adaptability which is crucial to meet the changing needs of the municipal organization (Gibson, 2000, p. 150). Examining flexibility is therefore a must and can be perceived in three ways: physically, financially and functionally (Gibson, 2000, p. 150). The ability to get greater flexibility (physically, functionally and financially) from a naturally inflexible resource is the strategic task that lies ahead for municipalities' real estate managers. Thus, managers need to think differently about real estate portfolios. By linking the physical, functional and financial aspects is critical to the overall gaining flexibility from the inflexible asset (Gibson, 2001, p. 44).

To understand if a resource meets the current and future needs of an organization, an analysis should be undertaken examining the type of flexibility required in different situations (Gibson, 2000, p. 154). Table 1 shows criteria to evaluate assets and is required to understand what degree and type of flexibility is available within the objects of the municipal portfolio.

Table 1 Criteria for asset evaluation

| Dimension  | Issue                                      | Criteria                         |
|------------|--------------------------------------------|----------------------------------|
| Physical   | Ease of reconfiguring space                | Cost (and time) of change        |
|            | Efficiency of space                        | Percentage net to gross area     |
|            | Physical impediments to change             | Ceiling heights; bay widths      |
| Functional | Variety of activities/processes undertaken | Balance of uses within building  |
|            | Ability to support movement of staff       | Standardised furniture/equipment |
|            | Ability to change use                      | Building class (i.e. B1)         |
| Financial  | Ability to vacate                          | Contract length and exit costs   |
|            | Ability to let/sub-let                     | Potential for income             |

Table 1. Criteria for asset evaluation. (Gibson, 2000, p. 153)

Furthermore, real estate managers within Dutch municipalities have to consider the strategic decision when flexibility may or may not be required (Gibson, 2001, p. 42). Based on this, Gibson proposes a framework that groups the core and peripheral real estate objects within the portfolio, as seen in figure 4.

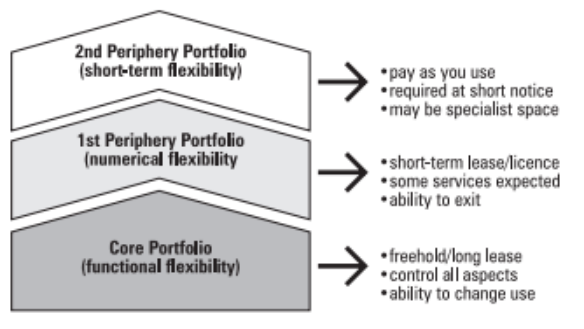


Figure 4. Three tier real estate management approach. (Gibson, 2000, p. 153)

### Agile organization

The way in which the business environment will shape by 2050 is uncertain. According to Darwin's theory of evolution specifies you have to adapt in order to survive (Fasolo, 2012; Ellis, 2016). Therefore it is imperative for organizations to be able to adapt to changes. According to Cannon (2017) the best way to reconcile new needs and old imperatives is not to invent a completely new kind of organization, but to add adaptability to the existing organization on the road towards an agile organization. Steps and measures can be taken to increase the adaptability of supply chains and make structures less rigid. In addition, workforce agility is important to consider as this is for Dutch municipalities a significant cost item (including social packages). Moreover, it is the area where resistance to the constant adaptation needed in the new world is likely to be greatest (Cannon, 2017, p. 7). In addition, the more flexible an organization becomes, the better it can anticipate change (Pasmore, 1994). Furthermore, Agile organizations manage the tension between agility and volatility and can turn it into business opportunity and competitive advantage (Cannon, 2017, p. 57). In short, agility is mission-critical and creates competitive advantage by allowing Dutch municipalities to rapidly respond to changes in the industry and thereby maintain competitive composition, which is key to achieve maximum added value to society; the ultimate goal for public bodies such as municipalities.

### **What actions should real estate organizations currently undertake?**

Preparations for the future should be encouraged and municipalities should start by continuously monitoring trends and developments within the industry and start to anticipate by forming an agile organization.

As van den Wildenberg (2017) indicates, many Dutch municipalities have in recent years made progress towards a professional real estate organization and have an integrated overview where basic information is sufficient to allow for strategic real estate management. However, in the Netherlands large differences can be found between the way in which municipalities organize their real estate management. Recent studies indicate that Dutch municipalities are mainly operating on operational level (LOVGM, 2016; Van den Beemt-Tjeerdsma et al., 2016), where the actual performance on tactical and strategical level underperforms significantly with the private sector (Drenth, 2018).

What is more, since this study indicates that in an Industry as a service, circular economy, Dutch municipalities will primarily operate on the strategic level. Hence, this study coincides with the study by Van den Wildenberg (2017) arguing and urging Dutch municipalities rapidly need to increase awareness of their current position, managerial approach and processes and start implementing strategic real estate portfolio management. This need is illustrated by two main reasons. Firstly, there are major challenges on the municipal real estate portfolios, such as; the accelerated sustainability of the municipal portfolio; the impact of technological developments; and the trend to go back to the core tasks and with that the increasingly strategic role that municipalities want to take in their real estate management. However, challenges also depict opportunities, but agility organization is required in order to be able to convert this into competitive advantage. Furthermore, real estate investment decisions have a long-term horizon and are capital intense, indicating the importance of strategic management of the real estate portfolio.

Secondly, public real estate requires significant public funding. municipalities in the Netherlands together have an estimated 83.5 million m<sup>2</sup> of wealthy public real estate (Bouwstenen voor Sociaal, 2011). These public funds mostly originating from taxes, must be spent effectively. The composition of Dutch municipalities' portfolios is very diverse and the diverse composition requires a structured approach in which the social or political objectives and property-technical approach are brought together. The process that facilitates this approach is called strategic portfolio management, a process that fits best on the goal of municipalities to become a directing organization. Directing organizations focus on their core tasks and take control as directors on the supportive tasks, such as housing.

### **The road towards strategic management: development of content and organization hand in hand**

The way to achieve strategic portfolio management requires customized approach and differs per municipality. However, the growth trajectory of a municipality can be illustrated. A growth model (figure 5) by Van den Wildenberg (2017), based on the five phases of Joroff (1993), can be applicable for each municipality to determine the organization's current position and identify the next steps to undertake. Progress in municipal real estate management requires a development of the real estate organization as a whole, shown in Figure 5 as the 7 S's by Mc Kinsey (Pascale & Athos, 1981). All variables are interconnected and the effectiveness and efficiency of the organization is determined by the weakest link.

The typical activities Dutch municipalities as shown in figure 5 are described based on observations from current and best practice in Dutch municipalities.

#### **1. Administrator:**

The first step is to gain insight by collecting information from all real estate objects needed for real estate management and increases transparency to all employees by making it openly accessible.

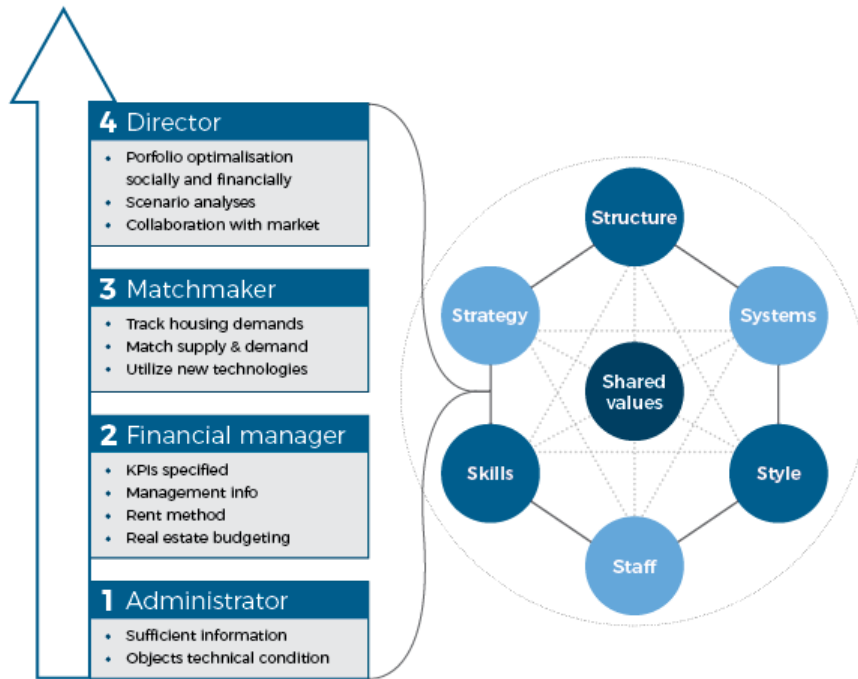


Figure 5: Current growth model role for Dutch municipalities. Based on Pascale & Athos, 1981; Van den Wildenberg, 2017) \* It is important to state that in the future the third step 'matchmaker' is the ultimate and most important step .

## 2. Financial manager

With the information of the various objects, municipalities are able to perform analyzes. This leads to more management information, both at object and portfolio level.

## 3. Matchmaker\*

When the municipal real estate information is clear on object and portfolio level, the housing demands of users and physical supply can be matched based on qualitative, spatial and financial criteria. When municipalities no longer own their real estate, this will become their top priority. The matchmaking role will always remain at the municipality, as matching the housing demand of the social users with physical supply is their core tasks and is their value attribution to society.

## 4. Director

This role is only applicable for municipalities that still own real estate. With all the information of the objects and the match between supply and demand, the municipality is able to fully manage an optimum between good social housing, operating result and incidental proceeds from sales. As a director, municipalities approach its real estate fully integrally from all the interests that it has. In addition to the consideration that she makes as a matchmaker between policy and real estate, she also involves the real estate and its potential in the spatial, economic and political developments of the city. The real estate can make a decisive contribution to area developments or, conversely, the real estate can be decisive when deciding which areas to develop as a priority. It can thus contribute to the municipality's investment strategy.

### 11.4.4. Conclusions & Discussion

This study suggests that in an 'Industry as a service' following CE principles, Dutch municipalities have little to none ownership of real estate and will conduct a different role as facilitator and a directing authority in which they will become decisive matchmakers. Using realtime big data as the most important source of information, artificial intelligence and automatization to process the correct municipalities tactical tasks and Blockchain as a means to securely log activities and transactions to ensure centralized data, easily and openly accessible for everyone. By portraying the circular economic industry as a service in 2050, it becomes evident that the most important conclusion for Dutch municipal real estate management is establishing well-operated strategic portfolio management. This study concludes that the technologic developments will have significant impact on

Dutch municipal real estate organization and that municipalities need to respond by starting to monitor innovations in order to be fully equipped for market disruptions and maintain competitive advantage. This is needed to opt for providing maximum added value for society – the primary objective of Dutch municipal real estate organizations.

Thus, this study recommends Dutch municipalities to explore the role as Business Strategist and experiment with ways to increase the organization's agility as theory suggests this to be crucial to maintain competitive advantage, which in return allows for achieving maximum value adding to society.

Furthermore, there are major challenges regarding the municipal real estate portfolios, such as; the accelerated sustainability of the real estate portfolio and the trend to go back to the core task. Therefore, the strategic role that municipalities have to take in becomes increasingly more important to manage their real estate. In addition, challenges also depict opportunities, however agility within the organization is required in order to be able convert this into competitive advantage. The ability to get greater flexibility (physically, functionally and financially) from a naturally inflexible resource is the strategic task that lies ahead for municipalities' real estate managers.

Lastly, the future role for municipal real estate managers is portrayed as 'matchmakers'; implementing real estate strategies to match the with overall municipal strategy and to matching societal demands with industries' supplies. This study argues that Dutch municipalities need to explore this role now in order to excel in the future.

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## 11.5. Nieuw leven in kerk en klooster: Een methodiek om religieus erfgoed maatschappelijk en financieel te herwaarderen

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Collectief32

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Anno 2018 staat religieus erfgoed in Vlaanderen voor grote uitdagingen. In het boek *“Het open kerkgebouw”*, merken De Bleeckere et al. (2014) op dat daar waar de kerk tot in de jaren ‘60 de geest vormde van de vaak nog ongeletterde dorpsbewoners, na 1970 priester- en kloosterroepingen samen met het aantal kerkgangers gestaag begonnen af te nemen. Deze situatie in Vlaanderen is illustratief voor het secularisatieproces in Europa en Noord-Amerika (Voas 2009).

### 11.5.1. Inleiding

De conceptnota *“Een toekomst voor de Vlaamse parochiekerk”*, van minister G. Bourgeois (2011) becijfert de afname voor de wekelijkse kerkmis op 18% (van 33% naar 5% kerkgangers) op 25 jaar tijd. Anderzijds wordt gewezen op de serieuze instandhoudingskosten van de circa 1800 Vlaamse parochiekerken, waarvan 38% volledig beschermd en 15% deels als monument (CRKC, 2014), die grotendeels door de overheid betoelaagd worden en 60% uitmaken van de middelen die beschikbaar zijn voor onderhoud en restauratie van alle Vlaamse beschermde gebouwen <sup>(vii)</sup>. De nota stipuleert dan ook de voorwaarden voor Vlaamse kerkelijke en gemeentelijke overheden om vanaf 2011 (nog) beroep te kunnen doen op subsidies. Ze dienen zich -middels de opmaak van kerkenbeleidsplannen- uit te spreken over het openstellen van bepaalde kerkgebouwen voor medegebruik of nevenbestemming en ook na te denken over herbestemming of sloop. Dit concept gaat uit van het samenvoegen van parochies (te wijten aan een groeiend tekort aan religieuze voorgangers, namelijk 237 voor 1800 parochies), waarbij lokaal aangestuurd dient te worden welke kerkgebouwen behouden blijven voor de eredienst.

Om lokale overheden en kerkbesturen te informeren en te ondersteunen bij de opmaak van dergelijke kerkenbeleidsplannen, wordt in 2012 het Centrum voor Religieuze Kunst en Cultuur (CRKC) opgericht (als gedeeltelijke staatsinstelling), dat zijn activiteiten start met een gedegen inventarisatie van de parochiekerken middels een enquête met 96% dekking. Datzelfde jaar geeft minister Bourgeois ook het startschot voor de oprichting van *“De Vlaamse erfgoedkluis”* (onder Participatiemaatschappij Vlaanderen) als rollend fonds om het behoud van (religieus en ander) erfgoed veilig te stellen. Vijf jaar later wordt het debat over vormen van medegebruik, nevenbestemming, herbestemming en zelfs sloop van de parochiekerk in circa 150 gemeenten gevoerd. Concrete actieplannen om de kerkenbeleidsplannen ook daadwerkelijk uit te voeren, lijken vooralsnog te ontbreken, anderzijds lijken lokale besturen hun animo te verliezen, wanneer gaandeweg de spelregels ter opmaak van de kerkenbeleidsplannen worden aangepast.

Voor die kerkgebouwen waar men wél al weet wat men wil doen, wordt begin 2016 -met steun van zes publieke partners- de interlokale vereniging *“Herbestemming Kerken”* <sup>(viii)</sup> opgericht met verlengd mandaat tot 2021. 2 jaar later blijken al 60 lokale kerkelijke overheden samen met lokale besturen -middels ondersteuning van een projectregisseur en bijgestaan door een architecturaal ontwerp bureau- actief op zoek gegaan te zijn naar gepaste nieuwe functies of nevenbestemmingen. Op een studiedag rond deze topic eind 2017 worden architecturale plannen getoond, maar vooralsnog geen realisaties waarin activiteit deze plannen leven inblaast, noch uitzicht op financiering ervoor. Een recente opvallende evolutie hierin, is dat men tracht uitdagende dossiers zoals de monumentale beschermde (maar niet meer bemenste) Gentse Sint-Annakerk en de Antwerpse *“Peperbus”*, waar tot op heden geen vooruitgang wordt gemaakt op lokaal niveau, met bovenlokale steun *“marktrijp”* te maken, via de *“Vlaamse erfgoedkluis”*.

De herbestemmingen die in Vlaanderen vooralsnog wél gerealiseerd werden, betreffen meestal kapellen van kloosters, scholen of ziekenhuizen (in private eigendom van de vzw's) die ook de fondsen ter beschikking gesteld hebben om de kerken te bouwen. Voor de parochiekerken die voor 60% eigendom zijn van de kerkfabriek (gebouwd na 1801) en voor 40% van de gemeente, lijken we nog lang niet aan een concreet implementeerbare strategie toe te zijn (Sterken, 2018).

Cijfers over de omvang van het patrimonium van Vlaamse kloosters en abdijen lijken vooralsnog te ontbreken of zijn fragmentarisch. Buiten onderzoekster Karen Lens die in het kader van haar lopende doctoraat een 270-tal Limburgse kloosters vanaf 1798 (<sup>ix</sup>) in kaart bracht -waarvan vandaag nog een 90tal actief- is er geen gedegen onderzoek verricht naar omvang en/of toestand van klooster- en abdijsites. In de Standaard (Yserbart, 2016) wijst de Bond Beter Leefmilieu op het woonpotentieel van leegstand in religieus erfgoed en poneert hierbij het getal 1200 voor het aantal kloosters. Bij navraag bij het CRKC, dient dit getal genuanceerd te worden, zonder dat hier evenwel exacte cijfers tegenover gesteld kunnen worden. In hun Atlas religieus erfgoed (CRKC, 2014) worden 1038 "huizen" van 301 religieuze instituten geteld voor 8137 religieuzen, waaronder ook appartementen, privéhuizen en adressen van rust- en ziekenhuizen. In driekwart van de religieuze huizen zouden minder dan tien mensen wonen. Eind 2017 neemt Collectief32, als collectief van onderzoekers en architecten, het initiatief om middels een enquête hier duidelijker zicht op te krijgen. De resultaten hiervan zullen eind 2018 beschikbaar zijn.

Tot op heden is in Vlaanderen geen strategie uitgeschreven of voorhanden om vast te stellen hoe lokaal om te gaan met deze vermeende 1200 Vlaamse klooster- en abdijsites, waar de huidige bemensing stevast uitdunt door veroudering.

Voorlopige conclusies uit de enquête van Collectief32 tonen nochtans weinig toekomstperspectief vanuit de verouderende congregaties voor hun materieel erfgoed en weinig zicht op welke middelen ze kunnen inzetten om dit te herwaarderen.



In Nederland zijn ondertussen al meer concrete voorbeelden te vinden over "hergebruikt" religieus patrimonium.

Ter illustratie (<sup>x</sup>):

De Geodienst van de Rijksuniversiteit Groningen, die samen met het Kadaster, heel wat data rond dit issue in kaart gebracht en toegankelijk heeft gemaakt voor het lekenpubliek, bericht bijvoorbeeld over 565 hergebruikte voormalige kerken: "ruim 60 % van deze kerken heeft een vernieuwde bijeenkomstfunctie. 122 kerken zijn nu een woning en 61 zijn in gebruik als kantoor. Een aantal kerken heeft tegenwoordig een sportfunctie."

Nochtans voorspelde een studie van de Rijksdienst voor het Cultureel Erfgoed in 2008 dat tegen 2020 bijkomend 1200 van de 4200 kerkgebouwen (nog in gebruik voor religieuze doeleinden) in Nederland in onbruik zouden geraken (Raats, 2012). Dit zou een versnelling betekend hebben van gemiddeld 22,5 kerkgebouwen per jaar naar gemiddeld 120 kerkgebouwen per jaar (van der Staak, 2013). Tussen 1968 en 2008 raakten immers reeds circa 900 Nederlandse kerkgebouwen in onbruik. Dit betrof toen de helft van het toenmalig rooms-katholieke kerkenpatrimonium versus slechts één tiende van het protestantse kerkenpatrimonium. Als gevolg van het verschil tussen hun gedachtengoed is het niet verwonderlijk dat er tot 2001 meer kerken werden gesloopt dan hergebruikt (De Vries, 2009). Bij de katholieken heeft het gebouw immers zelf een sacraal karakter, terwijl bij de protestanten enkel de dienst die in het gebouw plaatsvindt, een sacraal karakter heeft (Sterken, 2018).

In het artikel "Lege kerkgebouwen: slopen of omdopen?" merkt Raats (2012) op dat een gesloten "top down" besluitvormingsproces (dat niet opengedoken wordt om het maatschappelijk belang mee te laten wegen), kan leiden tot sloop van religieus erfgoed op grote schaal. Tien jaar geleden, positioneerden de Nederlandse bisschoppen zich expliciet door te stellen dat "bij gebrek aan een passende herbestemming de voorkeur uitgaat

naar afbraak van de kerk” (Nederlandse Bisschoppenconferentie 2016). Cijfers van verdere massale sloop van kerkgebouwen sinds deze “top down” beslissing” zijn echter nergens te vinden. Dat men het “bottom up” trouwens niet sowieso eens is met “top down” beslissingen, moge onder andere blijken uit het burgerinitiatief Taskforce welke is opgericht in 2006, op zoek naar alternatieven voor het sluiten van kerken (à rato van 24/jaar anno 2015) en kloosters (à rato van 12 per jaar anno 2015) en in het bijzonder van sloop ervan.

Hoewel dit doembeeld in Nederland de laatste tien jaar vooralsnog niet aan de orde geweest is, stelt zich de vraag wat er dan wél nodig is om alternatieven levensvatbaar te maken en te houden, zodat we niet evolueren naar gedwongen verkoop en/of sloop op langere termijn?

Lilian Grootswagers van Taskforce pleit ervoor dat gemeente en parochie samen met de buurt kijken naar herbestemming van de kerk. In het boek *“Het open kerkgebouw”*, merken De Bleeckere et al. nochtans op dat het creëren van een gezamenlijke betrokkenheid op een (economische) leefbare toekomst voor het (letterlijke) “lege” kerk en/of kloostergebouw niet vanzelf gaat. Voor sommige geloofsgemeenschappen is het al ondenkbaar om het kerkgebouw een buurtfunctie te geven omdat dit betekent dat buurtgenoten, dus ook andersgelovigen (bijvoorbeeld moslims), in de voormalige kerk komen, laat staan om een katholieke kerk te herbestemmen naar een moskee (Raats, 2012).

In het rapport *“Van oude waarden naar nieuwe waarde”* (Schuurman, 2009) worden cases aangehaald “waarin het karakter van het klooster verloren ging nadat de kloosterlingen het pand verlieten”. De auteurs stellen dat kloosters niet alleen beeldbepalend elementen blijken te zijn, maar dat de maatschappelijke meerwaarde van kloosters een publiek goed is, dat niet in de marktprijs tot uitdrukking komt. Verder waarschuwen ze ervoor dat “als er geen partijen zijn die in dit ‘publieke goed’ willen investeren, er geen enkele garantie is dat de meerwaarde behouden kan blijven.”

Welke systematische en geïntegreerde aanpak kan de kansen op concrete projecten rond herwaardering van religieus erfgoed (HRE) vergroten in Vlaanderen en Nederland?

Hoe kan het strategische niveau waar vandaag al op gewerkt wordt, bijvoorbeeld middels de opmaak van kerkenplannen (met kerk- en gemeentebesturen) aangevuld worden met een aanpak op buurt-, wijk- en stadsontwikkeling die een antwoord biedt op een (boven)lokale nood, zonder de economische leefbaarheid straks uit het oog te verliezen?

Welke maatregelen dringen zich -naast een aanvulling van objectieve cijfers en naast de geijkte top down strategieën van “kerk en staat”- op en in hoeverre zijn deze transposeerbaar naar West-Europa?

### 11.5.2. “Maatschappelijk vastgoed”

In het huidige debat wordt het issue van de Vlaamse parochiekerken behandeld via de opmaak van kerkenplannen, ‘t is te zeggen binnen de context van soortgelijke gebouwen binnen de gemeentelijke grenzen. Is het zinvol om de herwaardering van religieus erfgoed te behandelen binnen het grotere plaatje van de verduurzaming van maatschappelijk vastgoed?

Van de beemd (2016) beschrijft “Maatschappelijk vastgoed” aan de hand van 4 definities als zijnde gebouwde voorzieningen waarin publieke (Vlak 2007) en/of sociale (Veuger 2014) diensten voor leefbare en vitale wijken en buurten (VROM 2007) aangeboden worden door of voor burgers (deels) door publieke middelen (VNG 2014), vanuit een erkend maatschappelijk belang (Veuger et al., 2017).

In de publicatie *“maatschappelijk verantwoord vastgoed”* (Follens, 2014) wordt “maatschappelijk vastgoed” gedefinieerd als zijnde gebouwen die ten goede (dienen te) komen van de gemeenschap. Het onderzoek begint met het in kaart brengen van het patrimonium in een gemiddelde gemeente, op buurt, wijk-, gemeentelijk en regionaal niveau. Hierbij wordt vastgesteld dat de Vlaamse gemeenschapsvoorzieningen (op onbelastbare Vlaamse percelen) kampen met een aanzienlijke oppervlakte, namelijk circa 20 miljoen m<sup>2</sup> (AAPD, 2014) waarvan een groot deel onderbenut en/of slecht gepositioneerd is, dat véél kost (onder andere in onderhoud en verbruik) en weinig inkomsten genereert. Anderzijds wordt gewezen op de hoge wachtlijsten voor scholen en woonzorgvoorzieningen en wordt hardop de vraag gesteld hoeveel het de maatschappij gaat kosten als we blijven verderdoen zoals we bezig zijn?

In de publicatie worden een aantal zoekrichtingen voorgesteld om te evolueren van een aanbod (met issues) vandaag naar een aanbod met meer financieel én maatschappelijk rendement. Of met andere woorden om te evolueren van “maatschappelijk vastgoed” naar “maatschappelijk **verantwoord** vastgoed” (MVV)! Deze zoekrichtingen hebben zowel te maken met het verbinden van tekorten en overschotten in ruimtevraag en aanbod als met het inzetten op meer aanpasbare en multifunctionele en gastvrije gebouwen op de juiste locatie. Ook de rol van de overheid wordt bevraagd: wil die eigenaar blijven van al haar gebouwen of kan een evolutie zinvol zijn naar een rol waarbij ze maatschappelijke functies programmeert en faciliteert?

Er lopen in Vlaanderen al experimenten binnen de hierboven opgesomde zoekrichtingen voor verduurzaming van maatschappelijk vastgoed, die ook het Vlaamse religieus erfgoed mee betrekken. Om er maar een paar op te noemen vanaf 2016:

- In Genk rees in de zomermaanden een pop up jeugdhuis op in een leegstaand klooster.
- In Mechelen wil men de herbestemming van de kerk tot multifunctioneel buurtcentrum tot stand brengen door de opbrengsten uit een promotie-ontwikkeling van een 20tal woningen.
- In Dilbeek was de gemeente trekker om via 10 workshops samen met de burgers te gaan bekijken wat de kerken en pastorijen voor de buurt kunnen betekenen.
- En nu scholen ook mogen huren in gebouwen die niet van hen zijn, koos een school in het Leuvense met een tijdelijke huisvestingsvraag voor de creatieve oplossing om onderdak te vragen aan de congregatie van een klooster uit de buurt.

Het blijven echter experimenten in de marge, die zeker nog geen mainstream geworden zijn. Er bestaat nog een strategisch geleide aanpak waarbij steevast een analyse wordt opgemaakt van de locatie en de staat van de religieuze gebouwen en andere gemeenschapsvoorzieningen, de noden van de buurt, wijk en regio en de beschikbare middelen via de overheid en/of crowdfunding en/of ‘markt’, binnen de zoekrichtingen zoals hierboven beschreven.

### 11.5.3. De rol van religieus erfgoed binnen “maatschappelijk vastgoed”

Het Vlaamse Agentschap Onroerend Erfgoed (Vandaele, 2010) stelt dat in vele gevallen het behoud van de oorspronkelijke (hoofd)bestemming of functie de beste garantie is voor verder behoud van het erfgoed en dat nieuwe bestemmingen die bij die traditionele (boven)lokale identiteit van het religieuze erfgoed aansluiten, de kans op behoud ervan vergroten. Ter illustratie (<sup>xi</sup>):



100 jaar geleden gaven 80 zusters les aan 340 wezen in de Kontichse Altenawijk. Vandaag worden in dezelfde verbouwde schoolgebouwen 700 leerlingen onderricht door 45 leerkrachten. Sociaal-culturele activiteiten van school en wijk vinden plaats in de voormalige kloosterkapel. Het beeldbepalende kloostergedeelte is nu een horecazaak met verhuurbare vergaderruimtes en de kloosterannex is omgebouwd tot 26 flats voor ouderen.

Deze herwaardering van religieus erfgoed kan gezien worden als “maatschappelijk **verantwoord** vastgoed” (MVV), in de zin van “vastgoed waarin vraag en aanbod op elkaar afgestemd zijn en blijven” (Couplez, 2018) en illustreert het potentieel van hergebruik om de wijk meer zuurstof te geven en de lokale identiteit te verstevigen (De Vries, 2009).

Ten tijde van die zusters, stelde psycholoog William James al (1902) dat wij het meest over iets te weten komen door het met een vergrootglas te bekijken en/of onder zijn meest uitgesproken vorm. Religieuze gebouwen zijn cultusgebouwen. Fredheim & Khalaf (2016), wijzen in hun artikel “*The significance of values*” op 3 soorten erfgoedwaarde: instrumentele, potentiële en accounting (vastgoed) waarde. Wat betreft de potentiële waarde

verwijzen ze naar studies van Throsby (2001), Mason (2002), Feilden (2003), Keene (2005), Orbaşlı (2008) en ICOMOS New Zealand (2010) die allen spreken over sociale, spirituele en symbolische waarde van cultureel erfgoed.

Illustreert het voorbeeld uit Kontich niet dat de meest uitgesproken vorm van “maatschappelijk vastgoed” misschien wel bij religieus erfgoed ligt? Het eigene aan gemeenschapsvoorzieningen, is immers dat ze vooreerst ruimte bieden aan maatschappelijke spelers, zoals bijvoorbeeld onderwijs- en ouderenvoorzieningen. Maar als we denken aan vergaderruimtes met horeca, zien we hier ook hun potentie om ontmoeting te faciliteren, de zogenaamde potentiële sociale waarde van erfgoed. En bij erfgoedbakens ontwaren we bovenop de instrumentele en de potentiële sociale waarde ook hun potentiële symbolische waarde. Mensen identificeren zich met de beeldbepalende gebouwen in hun buurt, waarbij -tot minstens één generatie geleden- religieus erfgoed, vaak gelinkt aan gemeenschapsvorming, gemeenschapsondersteuning en diocesane werking een behoorlijke rol speelde.

In hun rapport “*Tel je zegeningen*” doen Castillo et al. (2008) een poging om het “maatschappelijke rendement van christelijke kerken in Rotterdam en hun bijdrage aan sociale cohesie” te berekenen. Ze stellen zich namelijk de vraag hoe groot het bedrag is dat de gemeente Rotterdam bespaart door de maatschappelijke activiteiten en het vrijwilligerswerk van de christelijke kerken. Gebruik makend van de Maatschappelijk Rendement Monitor en de bijbehorende interviewmethode zoals door Stichting Oikos<sup>(xii)</sup> ontwikkeld, wordt het gemiddelde maatschappelijk rendement van een kerk in Rotterdam geschat op 442.000 euro. In totaal betreft dit dus tussen de 110 en 133 miljoen euro per jaar, door de voornamelijk vrijwillige inzet van mensen die namens een kerk maatschappelijke activiteiten uitvoeren, vooral op het terrein van de psychosociale en maatschappelijke hulpverlening zoals het bezoeken van ouderen, de opvang en ondersteuning van kwetsbare groepen (asielzoekers, verslaafden, daklozen) en telefonische hulpdiensten.

Anno 2018 telt een gemiddelde Vlaamse gemeente van circa 20 000 inwoners 6 kerken (Follens, 2014), wat organisch zo gegroeid is. In onze geseculariseerde samenleving zouden er anno 2018 wellicht minder kerken ontworpen worden ten voordele van meer rusthuizen en scholen dan circa 100 jaar geleden. Met het rapport van Castillo et al. in gedachten, rijst de vraag of er naast meer financieel rendement ook meer maatschappelijk rendement zou behaald worden?

En wat kan dit betekenen voor de HRE binnen het grotere plaatje van MVV, waar het erom gaat om te beslissen in welke gebouwen men (al dan niet) verder gaat investeren om maatschappelijke impact te genereren?

Tot op heden werd weinig tot geen onderzoek verricht naar de mogelijke voordelen om beide maatschappelijke huisvestingsvraagstukken (zowel religieus erfgoed als maatschappelijk vastgoed) stevast samen te bekijken.

#### **11.5.4. Onderzoek en ontwikkeling**

##### **Vastgoedwaarde versus spirituele waarde**

Zonder exhaustief te willen zijn, volgt hier een overzicht van thema's met een link naar HRE waar verschillende Vlaamse faculteiten vanuit hun eigen perspectief onderzoek naar verrichten.

De universiteit van Hasselt doet onderzoek naar “adaptive re-use” van kloosters en biedt advies aan in verband met neven- en herbestemming van kerken. Aan de VUB wordt onderzoek gedaan naar naar aanpasbaar en veranderingsgericht bouwen en aan de faculteit theologie en religiewetenschappen van de KUL bekijkt Derde (2016) dit thema als een pastorale uitdaging. De verschillende invalshoeken voor deze Vlaamse onderzoeken blijven echter naast mekaar bestaan met een gemiste kans op kruisbestuiving om het issue van “niet bemenst religieus erfgoed” aan te pakken.

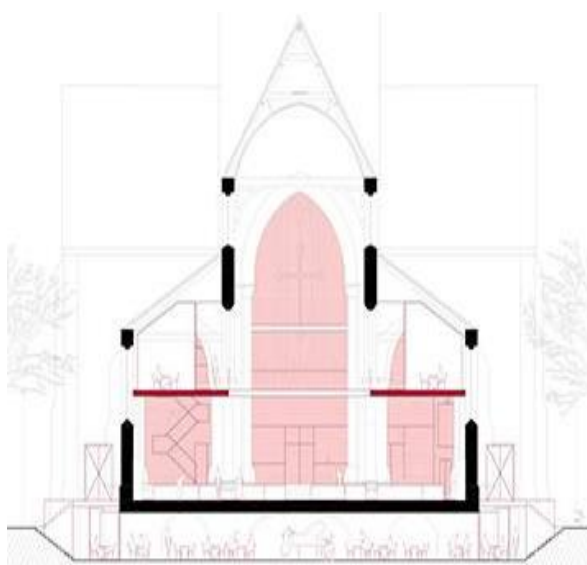
In het huidige onderzoeks- en ontwikkelingsdiscours blijven de potentiële spirituele en de “accounting” (vastgoed) waarde van religieus erfgoed Fredheim & Khalaf (2016) eerder diametraal tegenover mekaar staan dan geïntegreerd.

Aan de ene kant zien we met betrekking tot het vastgoedmatige aspect in Nederland een speler op de markt, zoals RELIPLAN, die religieus erfgoed makelt en ontwikkelt, met de nadruk op de “accounting” (vastgoed) waarde van religieus erfgoed.

In Vlaanderen bestaat dit soort niche-makelaars nog niet, wél zien we dat leegstaande kloosters en kerken soms via publieke makeldiensten (en in het bijzonder van het net van “de federatie voor advies & objectieve verkoop voor onroerende overheidsgoederen & verplicht te verkopen private goederen”) op de private “markt” gebracht worden, met de nadruk op de “accounting” (vastgoed) waarde ervan.

Aan de andere kant zien we dat, daar waar De Vries (2009) als kader voor succesvol hergebruik stelt dat “de transformaties met respect dienen te gebeuren voor de ongewone ervaring van de voormalige kerkruimtes, waarbij extra muren of onnodige openingen vermeden dienen te worden en de ingebouwde constructie op een reversibele wijze dient geconcipeerd te worden”, Vande Keere et al. (2018) waarschuwen “voor hergebruik in een geseculariseerde context zonder rekening te houden met de complexe spirituele en sociale potentie ervan”. In hun ontwerpend onderzoek, tonen ze hoe hergebruik gebaseerd kan worden op immateriële erfgoedwaarden, “die ook toekomstige generaties en migrantengemeenschappen kan aanspreken in de geest van zijn voormalige gebruik”, verder dan het ruimtelijk-functionele.

En hoewel Langston et al. (2007) “adaptive re-use” definieëren als een geïntegreerde strategie om naast de verbetering van de maatschappelijke en omgevingsgebonden performantie van gebouwen ook de financiële performantie ervan te verbeteren, is dit een item dat in het ontwerpend onderzoek zoals behandeld in “*Heritage without heirs*” door Vande Keere et al., (2018) vooralsnog niet op een geïntegreerde manier meegenomen lijkt te worden.



Ter illustratie: voor de Sint-Jozef kerk in de Rabotwijk in Gent wordt in dit artikel een architecturaal voorstel gedaan om de vloeroppervlakte en de bereikbaarheid ervan te vergroten, middels nieuwe tussenverdiepingen in de zijbeuken en twee bijkomende ingangen aan de kruising van schip en transept. De ondergrondse verdieping kan door uitgraving ervan ook bereikbaarder worden. Dit soort voorstellen houdt rekening met de maatschappelijke waarde van de site, de fysieke mogelijkheden voor het toekomstig (reversibel) hergebruik volgens haar oorspronkelijk karakter, het historische belang van de site, de stedenbouwkundige, gemeenschapsvormende en bouwfysische omstandigheden ervan.

Tegelijk wordt hierin vooralsnog niet expliciet becijferd wat dit soort ingrepen gaan kosten en/of opbrengen,

financieel en maatschappelijk, laat staan wie de vastgoedontwikkeling gaat financieren en/of op een haalbare manier exploiteren.

Als de meerwaarde van deze cultusgebouwen uitstijgen boven de “vermarktbaar” vastgoedwaarde, wat is er dan nodig om toekomstscenario’s ervan te verkennen waarin het respect hiervoor samengaat met een levensvatbare exploitatie?

### Ontwikkelingen in dialoog

In Duitsland trok eind 2017 de conferentie “*Church(es) in Change*”, georganiseerd door de protestantse en evangelische kerk, de regering en het Parlement van de deelstaat Brandenburg en de Förderkreis Alte Kirchen Berlin-Brandenburg/FAK BB een 150-tal deelnemers, waaronder vele lokale verenigingen. Tijdens de bespreking

over een 15 à 20tal lege kerken in het Duitse Berlijn-Brandenburg legde men de nadruk op de in onbruik geraakte ruimtes, zonder functionerende kerkbesturen, desondanks het feit dat vele kerken in Brandenburg waarschijnlijk in de beste conditie ooit zijn gezien de vele middelen die sinds 30 jaar aan restauratie besteed werden. De bisschop van Berlijn-Brandenburg, poneerde hier expliciet dat lobbying om de bedreigde dorpskerken te redden, gevolgd dient te worden door een constructieve samenwerking met de overheid én het maatschappelijk middenveld om sloop noch verkoop vol te kunnen houden.

Het belang van dialoog wordt al langer dan vandaag aangehaald via relevant onderzoek. Ruimtelijk planner Desendere (2006): “Om te voorkomen dat in 2026 kerkgebouwen massaal te koop staan en hen een commerciële bestemming boven het hoofd hangt, zal men vandaag moeten zoeken naar mogelijke herbestemmingen. Dit vraagt een grote openheid tot dialoog waarbij Kerk, gemeentebesturen, hogere overheden, sociale en culturele instellingen, erfgoedverenigingen en private instellingen als partners moeten beschouwd worden. De toekomst voor kerkgebouwen ligt niet in het weerhouden van bepaalde nieuwe bestemmingen maar wél in de bereidwilligheid om als Kerk en overheid elkaar in de dialoog als partners te beschouwen. Samen met architecten, kunsthistorici, monumentenzorg en mogelijke overnemers dient men op zoek te gaan naar gepaste nieuwe bestemmingen. Het niet durven open staan voor nieuwe concepten is daarbij de grootste drempel. De betrokkenheid van de gemeenschap en belanghebbenden bij alle fasen van de ontwikkelingen is de enige mogelijkheid om deze drempel te overwinnen.”

Het Vlaamse Agentschap Onroerend Erfgoed, het Nederlandse Nationaal Restauratiefonds (gebaseerd op het rapport van de Nederlandse ontwikkelaar BOEi in deze sector) en het English Heritage stellen dan ook terecht dat een onderbouwd, transparant en consistent proces het nodige participatieve, toegankelijke draagvlak dient te creëren om een programma te kiezen met respect en meerwaarde voor het gebouw dat via een herkenbare, duurzame en kwalitatieve ingreep vormgegeven zal worden (Sterken, 2018). En daar waar het “*Vaticaanse charter voor hergebruik van oude kerkelijke gebouwen*” nog benadrukte dat de garantie voor compatibel gebruik van religieuze gebouwen op elkaar afgestemde acties vereiste van de staat, lokale overheden en kerkelijke instituten, met het oog op het definiëren van coherente programma’s, zien we ondertussen ook bemiddelende (middenveld)organisaties hier een belangrijke rol spelen. Indien nodig worden op deze manier bedreigde redundante kerken overgenomen, dringende basisreparaties uitgevoerd en worden de kerkbesturen en lokale verenigingen die kerken verzorgen, geadviseerd. Volgens Future of Religious Heritage (FRH) gaat het in het Verenigd Koninkrijk onder andere om de Churches Conservation Trust die 350 redundante kerken beheren, de Historic Chapels Trust met circa 30 kerken, de Scottish Redundant Churches Trust en Friends of Friendless Churches met circa 50 kerken in Engeland en Wales. In Nederland wordt de Stichting Oude Kerken aangehaald, bijvoorbeeld in de provincie Groningen met 80 redundante dorpskerken (Fowler 2017).

Hoewel er in Vlaanderen al wel soortgelijke lokale pogingen ondernomen zijn, zoals bijvoorbeeld voor de 11000 m<sup>2</sup> grote Sint-Godelieve abdij in Brugge (<sup>xiii</sup>), blijven succesvolle realisaties van zo’n “Trust” vooralsnog uit. Leeft de bekommernis om via zo’n stichting kerken te redden van de sloophamer of gedwongen verkoop vooralsnog minder bij de Vlaamse burgers dan bij haar buurlanden?

De nood aan fundamenteel onderzoek naar een werkbare aanpak waarbij gemeenschap, kerk & staat en markt betrokken worden, dringt zich op.

#### 11.5.5. Procesanalyse van HRE?

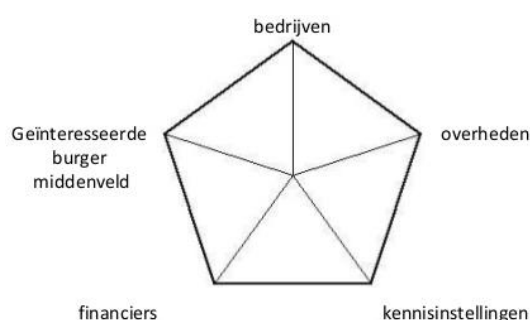
In een narratief interview met een expert terzake wordt gesteld dat naar aanleiding van het voorbeeld van de het terug gaan “leven” van de abdij van het park in Leuven na 15 jaar activatie door de “vrienden van de abdij”, het concept terug is opgepikt in Vlaanderen om de “genius loci” van dit soort erfgoed terug te laten spreken. Gezien de bestaansreden van religieus erfgoed een zeer sterke maatschappelijke connotatie heeft, wordt dan ook de nood erkend aan het opzetten van participatieve processen voor het gebruik van leegstaande religieus erfgoed, zeker in landelijke gemeentes. Men is in Vlaanderen zoekende naar hoe participatieprocessen opzetten voor erfgoed en hoe urgentie hiervoor creëren. Immers, als je het niet doet, loop je mogelijk kans op vertraging en kosten door buurtbewoners die procederen, zoals gebeurde bij de abdij van het Park in Leuven.

Tegelijk rijst de vraag of participatie volstaat om projecten ook financieel haalbaar te maken? In zijn afstudeerscriptie “*Een procesanalyse van de herbestemming van katholieke kerken*” wijst van der Staak, (2013)



op de noodzaak van een waardige functie die zichzelf financieel dient te onderhouden en toekomstbestendig dient te zijn vanaf het begin van het herbestemmingsproces, met een ondersteunende rol voor juridische en communicatieve aspecten. Vernieuwend in zijn discours zijn trouwens ook zijn aanbevelingen voor verder onderzoek rond de volgende topics: media-aandacht, opvolgende acties, continuïteit bij de betrokken partijen en het zorgvuldig vormgeven van procedures in een clusteraanpak.

De realiteit vandaag is dat deze HRE-vraagstukken onvermijdelijk een vastgoedgerelateerd aspect hebben, waarbij ook gebouweigenaars van “staat en kerk” zich wenden tot de bestaande partijen in de markt hiertoe zoals makelaars en ontwikkelaars. Als deze partijen de “leaders of the game” worden, worden ook vaak hun spelregels gehanteerd, die gebaseerd zijn op het halen van een financieel rendement op basis van vastgoed als accommodatie en verhandelbare asset (gerelateerd aan locatie-aspecten). Zoals architect Hoylaerts stelt in een panelgesprek, (Schreurs 2015): “Op het moment dat een beschermd gebouw leeg komt te staan, ontstaat er snel een financiële lobby, waarbij de hamvraag naar het sociaal en maatschappelijk belang niet expliciet meegenomen wordt.”



Als we kijken naar welke stakeholders uit de maatschappelijke vijfhoek<sup>(xiv)</sup>, bij dit proces betrokken worden, komen burgers vaak pas op het eind van de rit in beeld, namelijk bij het openbaar onderzoek, waarbij ze soms niet anders kunnen dan zich negatief uitlaten over kant-en klare plannen. Ook kennisinstellingen rond adaptive re-use, aanpasbaar bouwen of pastorale uitdagingen worden hierbij zeker niet sowieso meegenomen.

En zelfs als kerkelijke en publieke overheden samen rond de tafel gaan zitten met burgers, spelen de wetten van vraag en aanbod in de tot op heden niet-transparante vastgoedmarkt mee. Uit veldwerk bij het burgerinitiatief Symbiosis (2016-2017), kan voorlopig een eerste reeks conclusies gemaakt worden op basis van 2 rigoureuze haalbaarheidsonderzoeken naar HRE-vraagstukken rond co-housing voor senioren in grootsteden. De eerste case betreft een beschermd klooster, de tweede case een kerk in een achtergestelde wijk. Noch het ene project, noch het andere project werden vooralsnog gerealiseerd, despijts de vele uren studie- en vergaderwerk van heel wat stakeholders. De eigenaar van het religieus erfgoed blijft in zijn rol van “markt-bevrager” waarbij de prijs op een niet-transparante manier opgedreven wordt door ook andere partijen (met andere doelen) te bevragen naar een bod. En de strenge erfgoedregels, leggen aldus quasi een embargo op voor alle functies die geen exclusief doelpubliek beogen.... misschien eenvoudigweg bij gebrek aan een onderbouwd en gekend valabel alternatief?

Verder blijkt het beeldbepalende van het religieuze erfgoed een medaille met 2 zijden te zijn. Zoals Pinto et al. (2017) stellen, zien we in de twee cases van het veldwerk (hierboven genoemd) twee tegengestelde aanpakken: ofwel wegen de erfgoedbeschermingsissues zwaarder door dan de noden van de nieuwe gebruikers (in casu bij het beschermde klooster), ofwel vergen de aanpassingen die de nieuwe functie vereisen dergelijke substantiële veranderingen, dat de gebouwsidentiteit veranderd wordt (in casu bij de kerk in de achtergestelde wijk). Rond transformatiekosten gelden hier ook de basisregels die Pinto et al. (2017) beschrijven, namelijk hoe lager de compatibiliteit tussen de bestaande gebouwen en de nieuwe bestemming is, hoe hoger de transformatiekosten zijn en vice versa en dat bij de grote kostenposten de ingrepen horen nodig om de prestaties met betrekking tot energie en comfort up to date te brengen.

De investeringskosten om het religieus erfgoed inzetbaar te maken of te houden worden vooralsnog niet beschouwd naast de maatschappelijke kosten en baten ervan.

Tot op heden is er nog geen beproefde strategie ontwikkeld om gemeenschap, kerk & staat en markt toe te staan in co-creatie keuzes te maken om transformatie(kosten) te minimaliseren enerzijds en maatschappelijke baten te optimaliseren anderzijds.

### 11.5.6. Doelstelling onderzoek

Het belang van fundamenteel onderzoek naar de verknoping van HRE als MVV vormt de aanleiding tot dit voorgestelde promotieonderzoek. Het veld-, actie- en ander onderzoekswerk dat tot op heden verricht werd, leidt tot volgende (voorlopige) vierledige doelstelling van het onderzoek, waarbij een nieuwe syntax en vocabularium wordt voorgesteld om processen te lopen om het sociale en spirituele potentieel van religieus erfgoed te hervvaloriseren.

1. Definitie van HRE als MVV
2. Definitie van de MKBA in het co-creatieproces
3. Definitie van de “ontwikkelaar 2.0” in het co-creatieproces (van 2D naar 5D)
4. Definitie van een nieuw kader voor de “ontwikkelaar 2.0” van HRE als MVV

#### Doelstelling 1: HRE als MVV

Volgens de AAPD (2014) gaat circa 9 % van de percelen met nationale domeingoederen naar de gebouwen voor eredienst. In absolute termen lijkt 1,782 miljoen m<sup>2</sup> misschien niet veel in vergelijking met de circa 20 m<sup>2</sup> maatschappelijk vastgoed, waar ze mee deel van uitmaken. In relatieve termen, gaat het nochtans juist over die m<sup>2</sup> waar het meeste optimalisatiepotentieel ligt, zowel naar meer financieel als naar maatschappelijk rendement!

Als we uitgaan van de hierboven geformuleerde hypotheses namelijk dat ten eerste de vraag naar meer financieel en maatschappelijk rendement van religieus erfgoed dient bekeken te worden binnen de verduurzaming van andere gemeenschapsvoorzieningen en dat ten tweede nieuwe bestemmingen die bij die traditionele (boven)lokale identiteit van het religieuze erfgoed aansluiten, de kans op behoud ervan vergroten; kunnen we dan stellen dat bij religieus erfgoed het top down (lokaal bestuur en eigenaar) en bottom up (burger) zoeken naar een mix van drie functies, binnen het grotere geheel aan gemeenschapsvoorzieningen primordiaal is? Eén die garandeert dat het project zichzelf kan bedruipen, één die het potentieel tot verbinding aanspreekt en één die inspirerend werkt, waarbij het accent meer of minder op één van de drie functies kan komen te liggen, afhankelijk van de lokale situatie?

Bij de verduurzaming van maatschappelijk vastgoed gaan maatschappelijke spelers vandaag elk voor zichzelf, met de beste intenties, gebouw per gebouw te werk te gaan of maken ze, los van mekaar -elk met hun eigen agenda- plannen op voor bijvoorbeeld hun religieus- of onderwijspatrimonium. De kans dat ze in dezelfde vijver vissen van andere maatschappelijke spelers op zoek naar ruimte zoals bijvoorbeeld verenigingen (<sup>xv</sup>) om hun gebouwruimtes beter te benutten, is daarbij niet ondenkbaar. “Het beheer van maatschappelijk vastgoed met meer financieel én maatschappelijk rendement vraagt om als bestuur te durven samenzitten en een heel duidelijke visie uit te stippelen die soms een legislatuur overschrijdt maar altijd in het teken staat van de gebruiker, de burger. Waar willen we naartoe? Welke effecten willen we op lange termijn zien? Waar zijn de noden en de baten het hoogst?” (Couplez, 2018).

Architecten Paul Vermeulen en Paul Viérin bevelen lokale besturen aan, om -telkens wanneer ze denken aan een nieuwbouw of renovatie voor een nieuw programma- in eerste instantie te bekijken of het aanwezige religieus erfgoed hiervoor ingezet kan worden: “Stel bij elke gemeenschapsinvestering de vraag: kan het in de kerk? Voor veel van deze investeringen is een vrijkomende kerk een aantrekkelijk alternatief. Als de kerk erfgoedwaarde heeft of anderszins bepalend is voor de gemeenschap, dient de investering een dubbel doel: de nieuwe gemeenschapsvoorziening wordt gerealiseerd én de kerk blijft behouden.” (<sup>xvi</sup>)

En laat dit nu net het onderwerp zijn van de afstudeerscriptie van Lemmens, (2011), *“Geloven in maatschappelijk vastgoed: de kansen en mogelijkheden van nieuwe maatschappelijke functies in leegstaand religieus vastgoed.”* Uit diens conclusies blijken echter dat -ofschoon veel functies fysiek mogelijk zijn-, ze vaak financieel gezien niet haalbaar zijn, zonder subsidies of andere alternatieve opbrengsten omwille van de hoge aanpassingskosten.

Zelfs de (maatschappelijke) functies die volgens Lemmens het meeste kans maken, namelijk de broedplaatsen, de daklozenopvang en de eerstelijnszorgfuncties, acht hij alleen haalbaar wanneer de verwervings-en restauratiekosten laag, of de alternatieve opbrengsten hoog zijn.

Dit potentieel tot alternatieve opbrengsten relateert Van Leent, M. (2012) in “*Publiek Vastgoed*” aan locatie-aspecten en in het bijzonder aan het bereikbaarheidsprofiel en de multimodale ontsluitingskenmerken ervan.

Hoewel de vastgoeddimensie in de aanbeveling van de architecten Vermeulen-Viérin niet geëxpliciteerd wordt, is het niet moeilijk om het bruggetje te maken naar de verduurzaming van maatschappelijk vastgoed waar men bij voorkeur kijkt naar het religieus erfgoed met “prime location” en beeldkwaliteit om verder in te investeren. Daar waar investeren in een louter utilitaire herwaardering gepast lijkt op (minimaal ontsloten) C-locaties-, kan investeren in een ontmoetingsfunctie op (redelijke tot goed ontsloten) B-locaties- of zelfs in een identificatiefunctie op (optimaal ontsloten) A-locaties deze laatste zelfs doen fungeren als mogelijke hefboom van nieuwe stadsontwikkelingen.

Wil men aan een basale accommodatiefunctie een ontmoetings- of zelfs een identificatiefunctie toevoegen, dient men te kunnen berekenen of deze financieel exploiteerbaar zijn, door de financiële en maatschappelijke kosten en baten mee in ogenschouw te nemen.

### **Doelstelling 2: De MKBA in het co-creatieproces**

Vandaag blijft heel wat religieus erfgoed zonder overduidelijke marktwaarde onderbenut in zijn potentie tot gemeenschapsvorming en inspiratie. Zonder functie of beheerder, devalueert dit soort gebouwen vrij snel tot “klaar voor sloop”. Maar wat dit kost en zal kosten aan de maatschappij, wordt niet becijferd. Tot op heden is immers onduidelijk hoe deze maatschappelijke kosten berekend kunnen worden.

Vermeiren (2014) stelt dat het meten van maatschappelijk rendement een onderzoeksdomein is dat uit de sociale sector komt en momenteel nog in zijn kinderschoenen staat. Om bepaalde sociale doelstellingen te behalen, gaat men acties inplannen, waarbij werkingsmiddelen worden ingezet. Vaak wordt er dan intern geëvalueerd of de voorgestelde doelstellingen behaald zijn. Die doelstellingen zijn echter meestal maar stappen in de richting van een gewenst sociaal effect en impact. De evaluatie van dat gewenste effect, versus de investeringen die er gedaan worden om dit gewenste effect te bekomen, daar gaat het meten van “maatschappelijk rendement” over.

Een “maatschappelijke kosten baten analyse” (MKBA) probeert de (positieve en negatieve) maatschappelijke én financiële effecten van een project in te schatten. Er worden verschillende scenario's opgesteld met verschillende stakeholders, die ten opzichte van het 0-scenario geëvalueerd worden. Heel recent deed Gubbels, (2018) voor SCOBÉ een generieke aanzet om via de opmaak van een MKBA-analyse na te gaan wie de actoren zijn bij de herontwikkeling van een kerk door na te gaan wie voordelen geniet van deze maatschappelijke effecten. Door de betrokkenen te enthousiasmeren en te overtuigen van de verschillende belangen wil hij ze duiden wat een redelijke en haalbare verdeling van kosten kan zijn. De 6 mogelijke stappen binnen een MKBA (Ecorys & Verwey Jonker, 2014) die hij hierbij ziet, zijn: opmaak van de probleem- en omgevingsanalyse, opstelling projectalternatief en een '0-alternatief', beschrijving effecten van de alternatieven en monetarisering van effecten van het 0- en het projectalternatief, gevolgd door een overzicht van de verschillende maatschappelijke kosten en baten met gevoeligheidsanalyse voor de actoren.

Om tot een wetenschappelijk onderbouwde methode te komen is verder onderzoek via voldoende concrete cases met en zonder een monumentenstatus rond HRE nodig, waarbij alle stakeholders meegenomen worden zodat top down en bottom up mekaar kunnen ontmoeten in co-creatie om te komen tot herwaarderingsscenario's met meerwaarde voor allen.

De aanzet van SCOBÉ kan hierbij ingezet worden als light-versie van een MKBA om herwaarderingsscenario's van religieus erfgoed te evalueren niet alleen op financieel maar ook op maatschappelijk rendement.

### **Doelstelling 3: De “ontwikkelaar 2.0” in het co-creatieproces (van 2D naar 5D)**

De kans dat meer transparantie bij de verhandeling van vastgoed het verdienmodel voor makelen, ontwikkelen en verhandelen van m2 gebouw op termijn zal uithollen, is reëel. Veuger, (2017) ziet de opkomst van blockchain hierin “als disruptieve innovatie waarbij in potentie de huidige rollen en taken van spelers binnen de vastgoedmarkt gaan veranderen”. En door aan te tonen dat er vertrouwen is in blockchain en partijen in de vastgoedsector er graag mee aan de slag willen, geeft hij te kennen hier niet alleen in te zijn.

Stel nu, dat we het ontwikkelproces met veel getouwtrek tussen de klassieke “ontwikkelaar 1.0”, architect en wet, een 2D-proces zouden noemen, dat een klassiek product -een 2D-product- oplevert: vastgoed waarbij de grond gelijk gesteld wordt aan financieel rendement en het gebouw gelijk wordt gesteld aan zijn ene functie?

Kunnen we ons dan een 5D-product voorstellen, waarbij grond, gebruik, gebouw, financieel en maatschappelijk rendement evenwaardig betekenis zouden krijgen, (in plaats van gereduceerd te worden tot mekaar) en dat tot stand zou door bemiddeling van een “ontwikkelaar 2.0” in een 5D-proces met alle verschillende stakeholders uit de maatschappelijke vijfhoek en in het bijzonder ook de burgers, het middenveld en kennisinstellingen met expertise terzake?

Verder onderzoek is nodig naar hoe de MKBA als criterium bij het ontwikkelen van (MVV-projecten en in het bijzonder bij) HRE-projecten meegenomen kan worden, via het lopen van 5D-processen waaruit 5D-producten kunnen worden ontwikkeld.

Dit alles noopt tot onderzoek naar het mogelijke transcenderen van de rol van “ontwikkelaar 1.0” naar een “ontwikkelaar 2.0”, als bemiddelaar tussen de spelers van de maatschappelijke vijfhoek in een 5D-proces. Idealiter resulteert dit in aanbevelingen naar een nieuw verdienmodel om ontwikkelen te “transcenderen” vanuit een overkoepelende visie op het herwaarderen van de potenties van religieus erfgoed tot ontmoeting & inspiratie/identiteit.

En om niet in de analyse te blijven hangen, maar ook echt slagvaardig en effectief te kunnen handelen, kan in een volgende stap verder onderzoek verricht worden naar welk vehikel co-creatief ontwikkelen kan faciliteren en/of stimuleren en/of ondersteunen.

#### **Doelstelling 4: Nieuw kader voor de “ontwikkelaar 2.0” van HRE als MVV**

Eind 2016 worden bij wijze van actie-onderzoek een 10-tal bekende spelers uit de maatschappelijke vijfhoek in het Vlaamse veld uitgenodigd op een co-creatienamiddag rond HRE. De deelnemers lijken het erover eens dat wat vandaag bestaat, niet afdoende is om de grote vraag naar HRE te kunnen beantwoorden op een wijze die uitmondt in concrete realisaties met meerwaarde voor allen.

Om ontwikkelingen in gang te zetten die op het niveau van individuele projecten wellicht niet van de grond komen, lijkt bundeling van kennis en expertise nodig. Luidop wordt er hierbij gedroomd van een expertise centrum dat onder andere alternatieve financieringsmodellen aanreikt, niet alleen voor kerken, maar ook voor ander religieus erfgoed, van van project- en procesmanagers die de noden detecteren van alle stakeholders, met een mandaat van kerk en staat en van een vehikel dat onrendabele projecten kan financieren vanuit de opbrengsten van rendabele projecten.

Concluderend kan gesteld worden dat er bij de deelnemers animo is voor verder onderzoek naar de organisatie van een onafhankelijk alternatief netwerk/ vehikel, dat kan bestaan naast al wat er vandaag al bestaat.

#### **11.5.7. Vraagstelling onderzoek**

Om bovenstaande doelstelling te bereiken, is de volgende centrale vraag geformuleerd:

*Welke methodiek binnen welk innovatief kader kan “herwaardering van religieus erfgoed” (HRE) als “maatschappelijk verantwoord vastgoed” (MVV) faciliteren?*

De volgende (voorlopige) deelvragen leveren een bijdrage aan het beantwoorden van de centrale vraag:

1. Inzichtelijk maken hoe “top down” processen vandaag lopen versus “bottom up” processen en hoe kan het kaderen van HRE binnen MVV meer perspectief kan bieden op het terug laten renderen van het sociale en spirituele potentieel van religieus erfgoed?
2. Inzichtelijk maken hoe het 2D-proces naar 2D-product vandaag werkt bij MVV en HRE-projecten en hoe concepten als “co-creatie” en “MKBA” (i.h.b. m.b.t. socialisatie- en identificatiefunctie) kunnen ingezet worden als opstap naar een 5D-proces en 5D-product.
3. Hoe dient het 5D-proces naar een 5D-product (incl. een light “MKBA”) gevoerd te worden door de “ontwikkelaar 2.0” (aan de hand van reeds bestaande best practices en/of cases die zich aandienen in de loop van het promotieonderzoek)?

4. definitie van de prestaties die een concreet innovatief vehikel dient te leveren (ontwikkelmaatschappij?/ revolving fund?/ digitale tool?,...) om vraag en aanbod te linken volgens een 5D-proces naar een 5D-product, met accent op opmaak light “MKBA” als criterium bij ontwikkelen van HRE als MVV.

Een volgende stap zal eruit bestaan om de eerste conclusies uit deze voorlopige vragen te gaan toetsen bij data van een bepaald(e) Vlaams(e) stad(sgewest) en/of de opportuniteit om effectief een piloot 5D-proces te starten (als dat zich aandient in de loop van het promotieonderzoek) en zo telkens meer en meer te gaan verfijnen en uitbouwen, tot uit aan voldoende aantal lessons learned dit onderzoek opgetild kan worden naar een wetenschappelijk verhaal.

#### 11.5.8. Lijst van afkortingen

AAPD: Algemene Administratie van Patrimoniumdocumentatie

BOEi: Nationale Maatschappij tot Behoud, Ontwikkeling en Exploitatie van Industrieel Erfgoed

CRKC: centrum religieuze kunst en cultuur

FRH: Future of Religious Heritage

HRE: herwaardering religieus erfgoed

MBKA: maatschappelijke kosten baten analyse

MVV: maatschappelijk verantwoord vastgoed

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## **11.6. Digitalisering dienstverlening corporatiesector: stand van zaken, verklaringen en mogelijkheden voor de toekomst**

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KWH

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In dit artikel worden de resultaten die KWH (Kwaliteitscentrum Woningcorporaties Huursector) jaarlijks ophaalt met haar huurdersonderzoeken verder geanalyseerd om in kaart te brengen hoe het gesteld is met het gebruik van digitale kanalen binnen de corporatiesector. Verder gaan we in dit artikel in op hoe het gebruik van online kanalen zich verhoudt tot andere sectoren en wordt er getracht verklaringen te geven voor de mate van digitalisering in de sector.

KWH is een landelijk kwaliteitscentrum voor en door woningcorporaties. KWH is een vereniging die haar leden onderzoeken biedt om huurderswaardering omtrent klantprocessen in kaart te brengen. Het doel van deze onderzoeken is uiteraard het verbeteren van de dienstverlening van corporaties richting huurders. Van de ongeveer 330 woningcorporaties in Nederland zijn er ruim 150 aangesloten bij KWH. Deze corporaties doen onderzoek naar de dienstverlening rondom meerdere processen, zoals het mutatieproces (het verlaten of betrekken van een woning van de corporatie), het melden en uitvoeren van een reparatieverzoek, het uitvoeren van planmatig onderhoud en het contact hebben met de corporatie. Voor deze onderzoeken ondervraagt KWH de huurders van de corporaties.

Sinds 2014 is KWH ook partner van Aedes (de branchevereniging van woningcorporaties) binnen de Aedes-benchmark. Aan deze benchmark nemen bijna 300 corporaties deel. Eén van de onderdelen is het zogenaamde Huurdersoordeel waarbij de prestaties van de corporaties op het gebied van dienstverlening richting de huurder naast elkaar worden gezet. KWH verzamelt jaarlijks de resultaten van 275 corporaties op dit vlak en voert de analyses uit. Daarmee heeft KWH een goed inzicht in trends en ontwikkelingen binnen de sector. In dit artikel worden de resultaten die KWH jaarlijks vanaf 1995 ophaalt verder geanalyseerd om in kaart te brengen hoe het gesteld is met het gebruik van digitale kanalen binnen de sector. Vanwege de vergelijkbaarheid van resultaten ligt de focus hier op de resultaten van 2015 tot en met 2017. Verder gaan we in dit artikel in op hoe het gebruik van online kanalen zich verhoudt tot andere sectoren en wordt er getracht verklaringen te geven voor de mate van digitalisering in de sector.

### 11.6.1. Huurdersonderzoek

KWH maakt voor de onderzoeken naar de huurderswaardering gebruik van vijf verschillende vragenlijsten. In het volgende figuur is een overzicht van deze vragenlijsten en de doelgroep weergegeven.

| Vragenlijst                | Doelgroep                                                                            | Onderwerpen                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contact met de corporatie  | Alle huurders van een corporatie                                                     | Heeft men contact gehad?<br>Hoe heeft men contact gehad?<br>Hoe heeft men dat contact ervaren?                                                                       |
| Woning zoeken en betrekken | Huurders die onlangs (afgelopen maand) een woning van de corporatie hebben betrokken | Hoe ervaart men het zoeken naar een woning?<br>Wat vindt men van de bezichtiging?<br>Wat vindt men van de oplevering?                                                |
| Woning verlaten            | Huurders die onlangs (afgelopen maand) een woning van de corporatie hebben verlaten  | Hoe ervaart men het opzeggen van de huur?<br>Wat vindt men van de inspecties door de corporatie?<br>Wat vindt men van de eindafrekening?                             |
| Reparaties                 | Huurders bij wie onlangs een reparatie is uitgevoerd                                 | Hoe ervaart men het melden van het reparatieverzoek?<br>Wat vindt men van de uitvoering van de reparatie?                                                            |
| Onderhoud                  | Huurders bij wie onlangs groot of planmatig onderhoud is uitgevoerd                  | Wat vindt men van de informatie die vooraf is ontvangen?<br>Wat vindt men van het contact tijdens het project?<br>Wat vindt men van de uitvoering van het onderhoud? |

Tabel 1: Vragenlijst, doelgroepen en onderwerpen KWH (Bron KWH huurdersonderzoeken 2015 tot en met 2017)

Maandelijks worden door corporaties bestanden aangeleverd met gegevens van huurders die in aanmerking komen voor de bovenstaande vragenlijsten. In 2017 hebben 457.009 huurders een vragenlijst ontvangen. Daarvan hebben er 122.119 de vragenlijsten volledig ingevuld. Huurders van wie een e-mailadres beschikbaar is, ontvangen een vragenlijst via de e-mail. Aanvullend doet KWH voor alle corporaties telefonisch onderzoek om representativiteit te garanderen. Voor corporaties die over onvoldoende e-mailadressen beschikken, wordt relatief gezien meer gebeld.

KWH vraagt de huurders in twee vragenlijsten van welk kanaal de huurder gebruik heeft gemaakt. Hieronder per vragenlijst de exacte vraagstellingen die we in dit artikel verder gaan behandelen:

*(1) Contact met de corporatie:*

1. Heeft u de afgelopen 6 maanden contact gehad met uw corporatie?
2. Hoe heeft u de laatste keer contact gezocht met uw corporatie?
3. Welk rapportcijfer geeft u voor het contact met uw corporatie?
4. Hoe heeft u het liefst contact met uw corporatie?

*(2) Reparaties:*

1. Hoe heeft u uw reparatieverzoek gemeld?

Deze vragen zijn de afgelopen drie jaar niet gewijzigd, waardoor de ontwikkeling van de afgelopen drie jaar (2015-2017) inzichtelijk kan worden gemaakt.



### 11.6.2. Het gebruik van online kanalen in de corporatiesector 2015-2017

Als we een willekeurige huurder van een corporatie vragen of hij of zij de afgelopen 6 maanden contact heeft gehad met zijn/haar corporatie dan antwoordt 57% daarop met ja. Dit percentage is de laatste drie jaar erg stabiel (57,5% in 2015, 57,0% in 2016 en 57,3% in 2017). Onderstaande tabel toont van welke kanalen huurders de afgelopen drie jaren gebruik hebben gemaakt bij het contact opnemen met de corporatie.

| Kanaal                                    | Gebruik in 2015 (%) | Gebruik in 2016 (%) | Gebruik in 2017 (%) |
|-------------------------------------------|---------------------|---------------------|---------------------|
| E-mail                                    | 11,4                | 11,5                | 12,9                |
| Website (formulier of huurdersportaal)    | 5,8                 | 4,7                 | 5,8                 |
| Telefoon                                  | 66,1                | 67,6                | 65,3                |
| Persoonlijk met een medewerker op kantoor | 11,4                | 11,5                | 9,7                 |
| Persoonlijk met een medewerker in de wijk | 2,8                 | 2,7                 | 3,3                 |
| Anders                                    | 2,5                 | 2,1                 | 2,9                 |

Tabel 2: Gebruik online kanalen 2015-2017 (Bron KWH)

Uit de tabel blijkt dat het gebruik van online kanalen (e-mail en website) slechts minimaal is toegenomen de afgelopen 3 jaar: van 17,2% in 2015, na een dipje in 2016 (16,2%), naar 18,7% in 2017. Bovenstaande tabel gaat over alle mogelijke contacten met de corporatie. Het kan natuurlijk zijn dat sommige contactredenen zich minder goed lenen voor het gebruik van digitale kanalen, zoals het melden van overlast of een specifieke vraag over de huurverhoging. Daarom is het ook interessant om te kijken welke kanalen er worden gebruikt bij het melden van een reparatieverzoek. Dit is immers een klantproces dat zich erg goed leent om te digitaliseren.

| Kanaal bij melden reparatieverzoek     | Gebruik in 2015 (%) | Gebruik in 2016 (%) | Gebruik in 2017 (%) |
|----------------------------------------|---------------------|---------------------|---------------------|
| E-mail                                 | 7,5                 | 6,9                 | 6,8                 |
| Website (formulier of huurdersportaal) | 7,5                 | 8,5                 | 11,3                |
| Telefoon                               | 77,6                | 75,1                | 72,4                |
| Persoonlijk bij een medewerker         | 6,4                 | 8,4                 | 8,4                 |
| Schriftelijk                           | 1,0                 | 1,1                 | 1,1                 |

Tabel 2: Gebruik online kanalen bij reparatieverzoek 2015-2017 (Bron KWH)

Ook ingezoomd op dit proces is slechts een lichte stijging te zien van 15,0% in 2015 naar 18,1% in 2017 waardoor met name de druk op het telefonische kanaal iets is afgenomen.

### 11.6.3. Verschil digitalisering corporaties en andere sectoren

Na het zien van deze resultaten rijst de vraag hoe het kan dat het gebruik van digitale kanalen in de corporatiesector slechts mondjesmaat is toegenomen, terwijl in andere sectoren de digitalisering een enorme vlucht heeft genomen. Ter illustratie: 40% van de MijnOverheid-accounts is in het najaar van 2017 geactiveerd. In 2015 lag dit percentage slechts op 14% ("Hoezo MIJNoverheid?" Onderzoek naar knelpunten voor burgers bij MijnOverheid (2017)). Een toename van 285%. Binnen de bankensector deed onderzoeksbureau Nepa (2017) onderzoek naar het gebruik van internetbankieren in zeven Europese landen (onder 7.000 respondenten). Nederland stond toen samen met Zweden bovenaan de lijst, waarbij 97% van de (volwassen) bevolking gebruik maakt van internetbankieren. Volgens een uitvraag van het CBS is dit percentage gestegen van 77% in 2015 naar 82% in 2017. Het verschil tussen beide onderzoeken heeft te maken met het ondervragen van andere leeftijdsgroepen. Verderop in dit artikel gaan we in op mogelijke verklaringen voor het achterblijvende gebruik van digitale kanalen in de sector.

#### 11.6.4. Heeft de sector nog onvoldoende geïnvesteerd in het digitaliseren van klantprocessen?

Uit een onderzoek onder de leden van KWH in 2015 kwam naar voren dat 37% van de corporaties op het moment van uitvragen (eerste kwartaal 2015 onder 71 corporaties) een huurdersportaal heeft. Nog eens 24% gaf aan dat het huurdersportaal er nog niet was maar het komende jaar (2016) wel gereed zou zijn. Bij 17% van de corporaties was het plan om een huurdersportaal in gebruik te nemen er wel, maar nog niet concreet genoeg en slechts 22% van de ondervraagde corporaties had nog helemaal geen plannen om een huurdersportaal toe te voegen. In 2017 is deze uitvraag (weliswaar in een andere vraagstelling) door Aedes binnen de Aedes-benchmark herhaald onder 263 corporaties (Aedes-benchmark 2017). Bij deze uitvraag geeft 54% van de corporaties aan een huurdersportaal te hebben. Uit dezelfde benchmark weten we dat de ICT-uitgaven in de sector met 10% zijn gestegen van 70 euro per VHE naar 77 euro per VHE. Dit laatste wil natuurlijk niet per definitie zeggen dat deze investeringen ook zijn gedaan op het gebied van digitalisering van de klantcontacten. De sector lijkt dus wel een effort te hebben gedaan op dit vlak. De vraag is of dit de juiste effort is? Is een huurdersportaal wel het juiste middel om te digitaliseren voor deze sector? In hoeverre zijn huurders bereid om gebruik te maken van een huurdersportaal als ze vooraf al weten dat ze het portaal niet vaak zullen gebruiken? Uit een grootschalig reputatieonderzoek medio 2017 (Aedes onderzoek naar sectorreputatie (2017)) onder ruim 14.000 huurders komt immers naar voren dat 21% van de huurders het afgelopen jaar geen contact heeft gehad met de corporatie en 42% heeft één of twee keer contact opgenomen.



Figuur 1: Hoe vaak contact afgelopen jaar? (Bron KWH)

In hoeverre staat een lage contactfrequentie een succesvol huurdersportaal in de weg? Is bij een dergelijk lage contactfrequentie een huurdersportaal wellicht te hoogdrempelig? De Overheid heeft dit bijvoorbeeld opgelost door aan MijnOverheid en ook DigiD verschillende andere instanties te koppelen zodat de frequentie en daarmee ook het gebruik toeneemt. Voor de corporatiesector is het zeker de moeite waard om daar gericht onderzoek naar te verrichten.

### 11.6.5. Kwaliteit van online dienstverlening is niet voldoende?

Het gebruik van digitale kanalen neemt toe als de dienstverlening die is geboden via die kanalen ook goed wordt beoordeeld. In deze alinea kijken we daarom hoe het contact via digitale kanalen wordt beoordeeld.

| Kanaal                                    | Beoordeling in 2015<br>Gemiddeld rapportcijfer | Beoordeling in 2016<br>Gemiddeld rapportcijfer | Beoordeling in 2017<br>Gemiddeld rapportcijfer |
|-------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
| E-mail                                    | 6,9 (SD 1,76)                                  | 6,9 (SD 1,86)                                  | 6,7 (SD 2,08)                                  |
| Website (formulier of huurdersportaal)    | 7,0 (SD 1,71)                                  | 7,1 (SD 1,69)                                  | 7,0 (SD 1,84)                                  |
| Telefoon                                  | 7,2 (SD 1,58)                                  | 7,2 (SD 1,58)                                  | 7,1 (SD 1,81)                                  |
| Persoonlijk met een medewerker op kantoor | 7,4 (SD 1,52)                                  | 7,4 (SD 1,61)                                  | 7,3 (SD 1,87)                                  |
| Persoonlijk met een medewerker in de wijk | 7,2 (SD 1,60)                                  | 7,2 (SD 1,61)                                  | 7,2 (SD 1,86)                                  |

Tabel 3: Beoordeling online kanalen 2015-2017 (Bron KWH)

Uit bovenstaande tabel komt inderdaad naar voren dat de digitale kanalen lager worden beoordeeld dan de traditionele kanalen. Dit geldt met name voor contact via de e-mail. Na een negatieve ervaring via een kanaal zal de huurder de volgende keer geneigd zijn een ander kanaal te proberen, waardoor het gebruik van digitale kanalen niet makkelijk toeneemt.

### 11.6.6. Digitaal sluit niet aan bij de wens van de huurders?

Van welk kanaal maakt de huurder eigenlijk het liefst gebruik in het contact met de corporatie? In de volgende tabel worden de voorkeurskanalen van de huurders in de afgelopen twee jaar weergegeven.

| Voorkeurskanaal                           | 2016 (%) | 2017 (%) |
|-------------------------------------------|----------|----------|
| E-mail                                    | 15,9     | 16,6     |
| Website (formulier of huurdersportaal)    | 2,1      | 3,0      |
| Telefoon                                  | 56,4     | 54,6     |
| Persoonlijk met een medewerker op kantoor | 15,0     | 14,0     |
| Persoonlijk met een medewerker in de wijk | 7,2      | 6,6      |
| Anders                                    | 3,4      | 5,2      |

Tabel 4: Voorkeurkanalen huurders 2016-2017 (Bron KWH)

Uiteraard is het voorkeurskanaal sterk afhankelijk van de contactredenen, maar als elke huurder gebruik zou maken van zijn favoriete kanaal dan zou het telefonische contact afnemen en het persoonlijke contact toenemen. Digitaal heeft op dit moment ook zeker niet de voorkeur van de huurder. Deze voorkeur is natuurlijk wel gebaseerd op het beeld dat de huurder heeft van die contactkanalen. Dit beeld kan maar hoeft niet gebaseerd te zijn op eerdere ervaringen met dat kanaal.

### 11.6.7. Conclusies en aanbevelingen

Vanuit de resultaten over 2015-2017 die KWH jaarlijks ophaalt over hoe het gesteld is met het gebruik van digitale kanalen binnen de sector kunnen we de volgende conclusies trekken en vragen stellen voor verder onderzoek. Nog geen twintig procent van de huurders heeft digitaal contact met zijn of haar corporatie. Het gebruik van digitale kanalen blijft daarmee flink achter in vergelijking met andere sector. Hoewel het lijkt alsof er voldoende in digitalisering is geïnvesteerd, blijft de kwaliteit van digitale kanalen achter bij de traditionele kanalen. Verder onderzoek zou zich kunnen richten op hoe de kwaliteit van digitale kanalen te verbeteren. Een andere uitdaging voor de sector is hoe een huurdersportaal kan worden ingezet bij een lage contactfrequentie.

In onderzoeken waarin huurders gevraagd wordt naar hun mening over bijvoorbeeld klantvisies of ondernemingsplannen stelt KWH regelmatig de vraag of de corporatie zou moeten investeren in persoonlijk contact of in digitalisering. Driekwart van de huurders geeft daar de voorkeur aan het investeren in persoonlijk contact. Dit geeft duidelijk aan dat de behoefte aan persoonlijk contact in deze sector groot is. Wellicht ervaren huurders de relatie met hun corporatie toch anders dan met een bank of een gemeente, wat maakt dat ze liever persoonlijk contact hebben. Kan persoonlijk en digitaal niet hand in hand gaan? Digitaal is, hoe we het ook wenden of keren, de toekomst. Aan corporaties de uitdaging om niet de digitalisering op zich voorop te zetten, maar een goede klantrelatie en de digitalisering volgend te laten zijn.

#### **11.6.8. Bronnen:**

Trustly (2017), Onderzoek naar gebruik internetbankieren in zeven Europese Landen door Nepa in opdracht van Trustly.

CBS (statline): Internet; toegang, gebruik en faciliteiten (2015-2017).

MijnOverheid (2017), "Hoezo MIJNoverheid?" Onderzoek naar knelpunten voor burgers bij MijnOverheid.

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## 11.7. Energy performance of social real estate in the Netherlands

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**Keywords:** Social Real estate, Energy performance, Building use, Regional differences, Stakeholders

### 11.7.1. Introductie

Nederland heeft de ambitie om in 2050 80%-95% minder CO<sub>2</sub> uit te stoten vergeleken met 1990 (Ministerie van Economische Zaken, 2016). Voor de energievoorziening is Nederland nu nog grotendeels afhankelijk van fossiele brandstoffen. Vooral de inzet van gas zal fors omlaag moeten om de energievoorziening verder te verduurzamen. Dit kan in de eerste plaats door in te zetten op energiebesparing (Rijksdienst voor Ondernemend Nederland (RVO), 2016). De gebouwde omgeving is verantwoordelijk voor circa 37% van het totale energieverbruik in Nederland en kent een groot besparingspotentieel (RVO, 2016). Het verbeteren van de energieprestatie van gebouwen kan een belangrijke rol spelen bij het beperken van CO<sub>2</sub>-emissies (Polesello en Johnson, 2016).

Vanwege het grote besparingspotentieel bij woningen is veel overheidsbeleid gericht op het verbeteren van de energieprestatie van de woningvoorraad. Maar ook in de utiliteitsbouw liggen veel besparingsmogelijkheden en zijn maatregelen genomen om energiebesparing te stimuleren (RVO, 2016). Voorbeelden hiervan zijn de energiebesparingseisen in de Wet milieubeheer, meerjarenafspraken energie-efficiëntie met het bedrijfsleven (MJA3) en een subsidieregeling voor sportaccommodaties (RVO, 2018, 23 juli, 24 juli en 25 juli). Bovendien hebben utiliteitsgebouwen, net als woningen, de plicht om bij oplevering, verkoop of verhuur een definitief energielabel<sup>24</sup> te overhandigen (RVO, 2018, 12 juli). Verder wordt in 2023 een labelplicht ingesteld voor kantoren. Bij afwezigheid van een energielabel C of beter, mag het kantoor niet langer worden gebruikt of verkocht (RVO, 2018, 16 juli).

Ondanks deze inspanningen zijn aanvullende maatregelen in de gebouwde omgeving nodig om de Nederlandse klimaatdoelstellingen te halen. Eén van de beleidsinstrumenten die wordt onderzocht door de Rijksdienst voor Ondernemend Nederland (RVO) en het Ministerie van Binnenlandse Zaken is een labelplicht voor utiliteitsgebouwen anders dan kantoren. Niessink, Menkveld & Sipma (2017) onderzochten daartoe de mogelijke besparingen, kosten, opbrengsten en terugverdientijden. Zij concludeerden dat vooral in horecagebouwen nog aanzienlijke energiebesparingen mogelijk zijn. Ook constateerden zij dat de energiezuinigheid van maatschappelijk vastgoed nog aanzienlijk kan worden verbeterd. Dit geldt in het bijzonder voor scholen en zorgvastgoed.

De energieprestatie van maatschappelijk vastgoed is het onderwerp van het huidige onderzoek. Voor maatschappelijk vastgoed zijn verschillende definities in omloop. In het algemeen gaat het hierbij om sociale en culturele voorzieningen (Veuger, 2011). We definiëren maatschappelijk vastgoed hier als de gebouwen met een functie op het gebied van onderwijs, sport, cultuur, welzijn, maatschappelijke opvang en zorg. Daarnaast rekenen we ook het vastgoed in publiek bezit daartoe.

Op welke locaties het maatschappelijk vastgoed met een ongunstige energieprestatie vooral te vinden is en bij welke actoren het besparingspotentieel ligt is nog onvoldoende bekend. Deze informatie is echter van groot belang voor het ontwikkelen van een effectieve energiebesparingsaanpak. In dit onderzoek verkennen we deze vragen. We brengen de regionale verschillen in de verduurzamingsopgave voor maatschappelijk vastgoed in beeld en gaan na hoe de eigendomsverdeling eruit ziet. Door te achterhalen waar maatschappelijk vastgoed met

<sup>24</sup> Het bij RVO.nl geregistreerde energielabel is een maat voor de energiebesparingsmogelijkheden en loopt van A (weinig verdere energiebesparing mogelijk) tot G (nog veel besparingen mogelijk).

een ongunstige energieprestatie staat en wie de eigenaren zijn, ontstaat een gedifferentieerd inzicht in de verduurzamingsopgaven, -kansen en de relevante stakeholders.

### 11.7.2. Methode

In dit onderzoek definiëren we maatschappelijk vastgoed als de gebouwen met een gezondheidszorg-, onderwijs-, sport- of bijeenkomstfunctie in de Basisregistraties Adressen en Gebouwen (BAG), aangevuld met het vastgoed in bezit van de overheid.

In de BAG zijn gegevens over alle gebouwen in Nederland opgenomen. Voor dit onderzoek vormt de BAG-voorraad met peildatum juni 2018 het uitgangspunt. We beperken ons tot de bestaande voorraad. Gebouwen waarvoor een bouwvergunning is afgegeven en gesloopt vastgoed zijn buiten beschouwing gelaten. Uit de BAG zijn verder gegevens over bouwjaar, gebruiksdoel, locatie en vloeroppervlakte betrokken. Bij de adressen waar het vloeroppervlakte onbekend was, is het gemiddelde oppervlakte van het gebruiksdoel in Nederland als waarde genomen. Voor gebouwen met meerdere gebruiksfuncties is het dominante gebruiksdoel bepaald op basis van het gebruiksdoel met het grootste vloeroppervlakte. Gebouwen met een dominante industrie- of een “overige” gebruiksfunctie zijn niet betrokken in de analyses van de energieprestatie. Deze gebouwen zijn niet labelplichtig en in vorm en functie zo verschillend (bedrijfshallen, parkeergarages) dat geen goede indicatie van het energielabel kan worden gegeven.

De eigendomssituatie is bepaald aan de hand van gegevens uit de Basisregistratie Kadaster (BRK). Daarbij maken we onderscheid tussen de volgende typen eigenaren: overheid, corporatie, overige non-profit, commercieel en particulier (zie ook tabel 1).

*Tabel 1: Indeling type eigenaren op basis van informatie in de Basisregistratie Kadaster*

| Type eigenaar      | Selectie in Basisregistratie Kadaster                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overheid           | Publiekrechtelijke rechtspersonen                                                                                                                                             |
| Commercieel        | BV, CV, NV, VF, Buitenlands rechtspersoon                                                                                                                                     |
| Particulier        | Natuurlijk persoon                                                                                                                                                            |
| Woningcorporaties  | Op basis van een lijst (zowel actueel als historisch) met kadastrale subjecten die bij het Kadaster bekend zijn als zijnde geregistreerd bij de Autoriteit woningcorporaties. |
| Overige non-profit | Kerkelijk, stichtingen en verenigingen (uitgezonderd woningcorporaties)                                                                                                       |

De energieprestatie van maatschappelijk vastgoed brengen we in beeld met behulp van de energielabels uit de labelregistratie van de Rijksdienst Voor Ondernemend Nederland (RVO) en de theoretische labelverdeling op basis van bouwjaarklassen.

Slechts een klein deel (namelijk 18%<sup>25</sup>) van het maatschappelijk vastgoed heeft een geregistreerd energielabel. Deze energielabels zijn naar verwachting niet representatief voor de energieprestatie van de totale voorraad maatschappelijk vastgoed. Een energielabel is verplicht op een transactiemoment, dat wil zeggen het moment dat een gebouw wordt opgeleverd, verhuurd of verkocht. Oudere, leegstaande panden met een slechte energieprestatie zijn daardoor waarschijnlijk ondervertegenwoordigd in de labelregistratie. De geregistreerde energielabels geven daardoor naar verwachting een te gunstig beeld van de energieprestatie.

<sup>25</sup> Status juni 2018. Energietabels in de utiliteitsbouw gelden op pandniveau. Als op een adres binnen een gebouw een geregistreerd label aanwezig is, is om die reden het energielabel aan het totale gebouwoppervlakte toegekend.

Gaan we uit van de theoretische energielabelverdeling op basis van bouwjaarklassen (tabel 2) dan kan dit juist een te ongunstig beeld opleveren van de energieprestatie. In een deel van de panden zijn inmiddels energiebesparende maatregelen genomen. Deze panden hebben daardoor in werkelijkheid een beter label dan op basis van de bouwjaarklasse wordt toegekend.

*Tabel 2: Energielabels naar bouwjaarklasse op basis van Bouwbesluit*

| Bouwjaarklasse | Energielabel |
|----------------|--------------|
| <1974          | G            |
| 1974-1981      | F            |
| 1982-1992      | E            |
| 1993-1999      | D            |
| 2000-2003      | C            |
| 2004-2005      | B            |
| >2005          | A            |

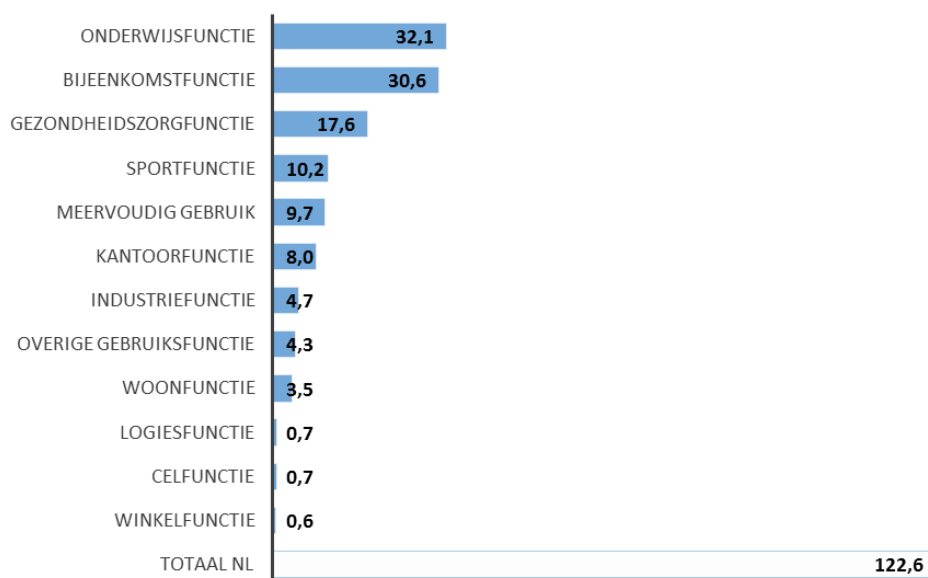
We gaan er in dit onderzoek vanuit dat de labelverdeling van het niet gelabelde maatschappelijk vastgoed in het midden zal liggen van de labelregistratie en de theoretische labelverdeling op basis van de bouwjaarklasse. Met behulp van de gemiddelde labelverdeling schatten we de energielabels van de niet gelabelde gebouwen. Voor het bepalen van de energieprestatie van het maatschappelijk vastgoed betrekken we zowel de beschikbare geregistreerde energielabels als de geschatte energielabels. Het resultaat noemen we de indicatieve energieprestatie/labelverdeling. De methodiek om tot deze indicatieve energielabels te komen is vergelijkbaar met die gebruikt in eerdere onderzoeken naar de energieprestatie van kantoren en overige utiliteitsbouw (Niessink et al., 20178; Arnoldussen, Koning & Menkveld, 2016).

### 11.7.3. Resultaten

Door de indicatieve labelverdeling te combineren met de voorraad- en eigendomsgegevens kunnen diverse uitsplitsingen van de indicatieve energieprestatie van maatschappelijk vastgoed worden gemaakt. In deze sectie wordt de omvang van het maatschappelijk vastgoed in Nederland en de indicatieve energetische opgave voor de verschillende gebruiksfuncties in beeld gebracht. Vervolgens worden geografische verschillen getoond en gaan we in op de indicatieve energieprestatie en opgave voor verschillende type eigenaren van maatschappelijk vastgoed.

#### Oppervlakte naar functie

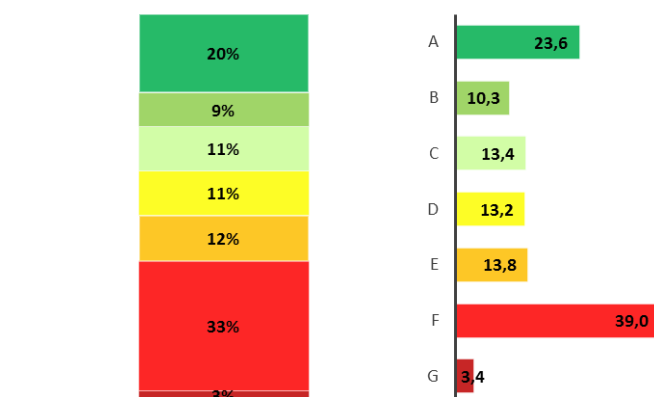
De omvang van de voorraad maatschappelijk vastgoed in Nederland bedraagt ruim 120 miljoen m<sup>2</sup> (Figuur 1). Onderwijsvastgoed en vastgoed in gebruik voor kunst, culturele of godsdienstige doeleinden (bijeenkomstfunctie) nemen de meeste vierkante meters in, gevolgd door zorgvastgoed. De vierkante meters kantoren, woningen, industrie, logies en winkels zijn in het overzicht opgenomen omdat ze in overheidsbezit zijn. Bijna 10 miljoen m<sup>2</sup> is maatschappelijk vastgoed dat voor meerdere doeleinden wordt gebruikt. Het gaat hierbij om een combinatie van onderwijs, bijeenkomst, zorg of sportfunctie of om combinaties van andere gebruiksfuncties in handen van publieke organisaties.



*Figuur 1: Oppervlakte maatschappelijk vastgoed naar functie (in miljoen m²)*

#### **Indicatieve energielabelverdeling en opgave naar functie en regio**

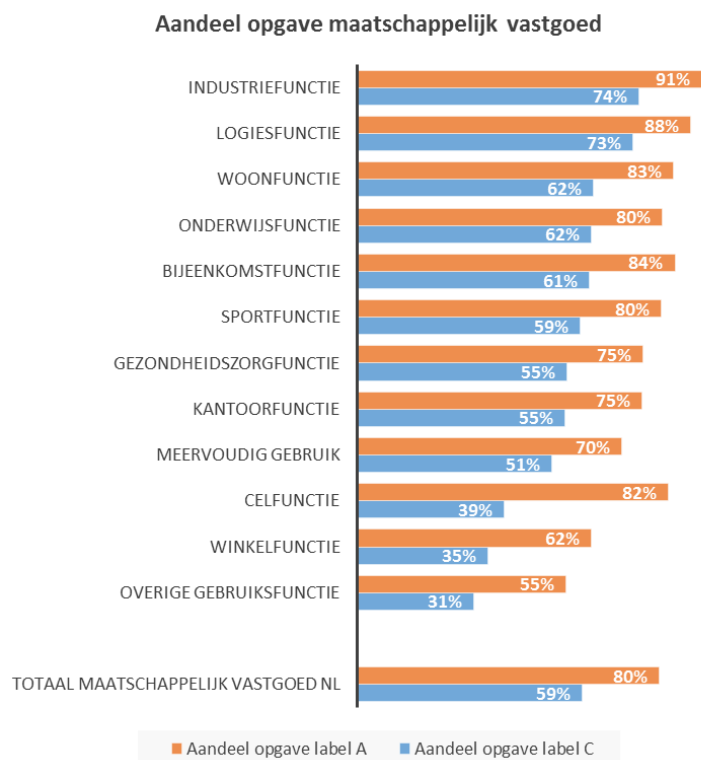
Er is een grote verscheidenheid in de indicatieve energielabelverdeling van maatschappelijk vastgoed (Figuur 2). Er is een substantieel deel gunstig maar een groter aandeel ongunstig gelabeld. Een kleine 24 miljoen m² is al naar het meest gunstige energielabel A gebracht. Dit komt overeen met een vijfde van het totale oppervlakte aan maatschappelijk vastgoed. Een kleine 40 miljoen m² (36%) heeft een zeer ongunstige energieprestatie (energielabel F of G). Om al het maatschappelijk vastgoed naar label C of A verbeteren, moet respectievelijk 69 miljoen m² (59% van het totaal) en 93 miljoen m² (80%) worden verduurzaamd.



*Figuur 2: Indicatieve energielabelverdeling maatschappelijk vastgoed naar omvang (in aandeel en in miljoen m²)*

De energetische opgave per functie van het vastgoed verschilt. Deze is het grootst voor overheidsbezit met een industriefunctie, op de voet gevolgd door het overheidsbezit met een logiesfunctie. Zoals in de methodische sectie is aangegeven zijn gebouwen met industrie- en overige gebruiksfunctie hier alleen in het overzicht meegenomen als het niet om de dominante gebruiksfunctie van het gebouw gaat. Ook vastgoed met logies-, onderwijs-, bijeenkomst- en sportfunctie kent nog relatief veel ongunstig gelabelde meters. Winkels en vastgoed met overige gebruiksfuncties in overheidshanden hebben de meest gunstige indicatieve energieprestatie.

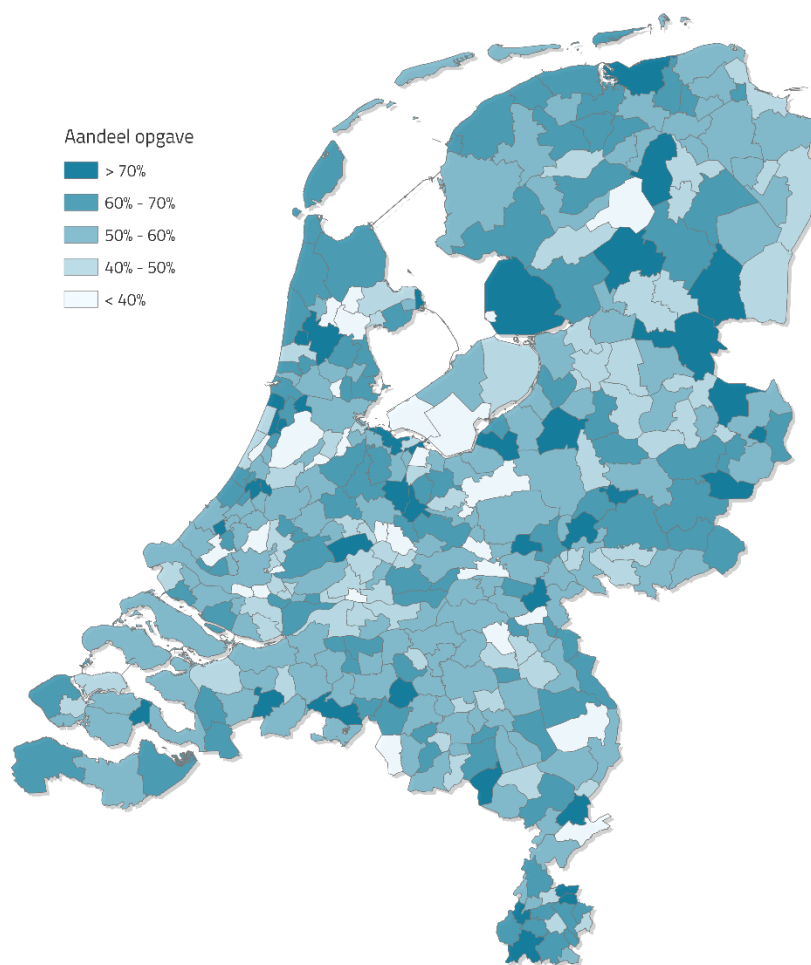




*Figuur 3: Aandeel van het maatschappelijk vastgoed naar functie met een indicatieve opgave naar energielabel C*

Figuur 4 laat de geografische spreiding van de energieprestatie van maatschappelijk vastgoed zien. In driekwart van de gemeenten voldoet meer dan de helft van het vastgoed nog niet aan energielabel C (overigens stijgt dat naar 99% van de gemeenten als de ambitie label A is). Wel bestaan er substantiële verschillen tussen gemeenten. In 30 van de 380 gemeenten heeft minder dan 40% van het maatschappelijk vastgoed een energielabel slechter dan C. Er zijn ook gemeenten met een aanmerkelijk grotere opgave. Voor 40 gemeenten geldt dat meer dan 70% nog niet voldoet aan label C.

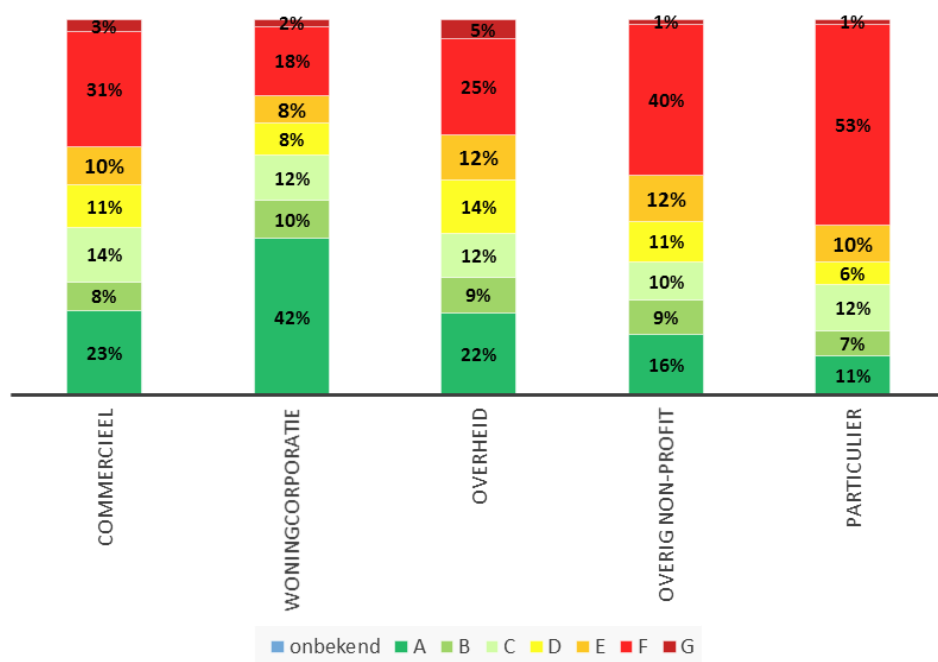
Ondanks deze verschillen zien we visueel geen duidelijk geografisch patroon. In de periferie komen we niet een heel ander beeld tegen dan in het economisch sterkere midden en Westen van het land. Ook de opgave in de grote steden ontloopt elkaar weinig. Nemen we de vier grote steden, dan voldoet in Amsterdam 57% van het maatschappelijk vastgoed nog niet aan label C, in Rotterdam 54%, in Den Haag 52 % en in Utrecht 51%.



*Figuur 4: Aandeel maatschappelijk vastgoed (m<sup>2</sup>) met indicatieve energielabel C opgave per gemeente.*

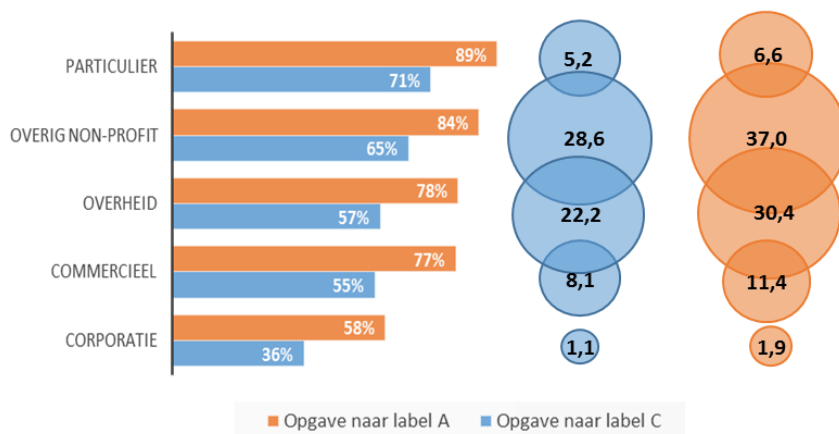
#### **Indicatieve energielabelverdeling en opgave naar type eigenaar**

De kosten voor het nemen van energiebesparende maatregelen liggen bij de eigenaren van het maatschappelijk vastgoed. Het is daarom relevant om te weten of de opgave per type eigenaar verschilt. Figuur 5 toont de indicatieve labelverdeling voor verschillende eigenaren. Woningcorporaties hebben het grootste aandeel gunstig gelabeld bezit. Meer dan 40% heeft een indicatief energielabel A. Corporaties hebben daarnaast ook het kleinste aandeel zeer ongunstige energielabels (20% heeft label F of G). Vooral veel maatschappelijk vastgoed in particulier bezit is zeer ongunstig gelabeld is. Meer dan de helft (54%) heeft een indicatief label F of G en slechts 11% een energielabel A.



*Figuur 5: Indicatieve energielabelverdeling maatschappelijk vastgoed naar type eigenaar*

De energieprestatie van het particuliere bezit kan nog flink worden verbeterd. 71% van het particuliere bezit voldoet nog niet aan energielabel C en bijna 90% nog niet aan label A. In vierkante meters is de opgave voor particulieren echter beperkt. Deze is het grootst voor de overige non-profit sector. De resterende opgave naar energielabel C (label A) bedraagt voor hen nog 28,6 miljoen m<sup>2</sup> (37 miljoen m<sup>2</sup>). Verder zien we dat een niet verwaarloosbaar deel van de opgave (20%, ofwel 13,3 miljoen m<sup>2</sup> voor verduurzaming naar label C) bij particulieren en commerciële partijen ligt. Aan wat voor vastgoed moet je dan denken? Dit kunnen onder andere kinderdagverblijven, particuliere woonzorgcomplexen en particulier onderwijsvastgoed zijn.



*Figuur 6: Relatieve (in aandeel van bezit) en absolute opgave (in miljoen m<sup>2</sup>) maatschappelijk vastgoed naar een indicatief energielabel C per type eigenaar*

#### 11.7.4. Conclusie en discussie

De omvang van de voorraad maatschappelijk vastgoed in Nederland bedraagt 122,6 miljoen m<sup>2</sup>. Dit is groter dan de voorraad kantoren en winkels bij elkaar (Compendium voor de Leefomgeving, 2016; Compendium voor de Leefomgeving, 2017). De resultaten van ons onderzoek laten zien dat de energieprestatie van maatschappelijk vastgoed nog aanzienlijk verbeterd kan worden. We constateren dat een kleine 70 miljoen m<sup>2</sup> (59%) een indicatieve energieprestatie slechter dan label C heeft. 93 miljoen m<sup>2</sup> (80%) heeft een energielabel ongunstiger dan A.

De indicatieve verduurzamingsopgave verschilt geografisch, per gebruiksfunctie en eigendomssituatie. In driekwart van de gemeenten voldoet meer dan de helft van het maatschappelijk vastgoed nog niet aan label C (dit geldt voor 99% van de gemeenten als de ambitie label A zou worden). Ondanks dat we geen geografisch patroon in de energieprestatie zien, betekent dit niet dat er geen regionale verschillen zijn in de opgave. Voor maatschappelijk vastgoed in kwetsbare krimpregio's met overaanbod en leegstand is de opgave waarschijnlijk complexer dan voor vergelijkbaar vastgoed in economisch sterkere gebieden.

Voor maatschappelijk vastgoed met een industrie- of logiesfunctie heeft een ongunstige energieprestatie. Maar ook relatief veel woningen en vastgoed met onderwijs-, bijeenkomst- en sportfunctie zijn nog ongunstig gelabeld. Voor het nemen van energiebesparende maatregelen in maatschappelijk vastgoed wordt al snel gekeken naar de overheid en non-profitsector. We zien inderdaad dat circa 80% van de resterende opgave (zowel voor label C als label A) bij deze partijen ligt. Maar richten we ons alleen op publieke en non-profit organisaties dan benutten we niet het volledige energiebesparingspotentieel. 20% van de opgave blijft in commerciële of particuliere handen. Bij de opzet en uitvoering van een (regionale) verduurzamingsaanpak is het dan ook noodzakelijk om ook deze stakeholders te betrekken.

In dit onderzoek hebben we indicatieve energielabels toegekend aan het maatschappelijk vastgoed zonder geregistreerd energielabel. Deze indicatieve energielabels zijn gebaseerd op het gemiddelde van de theoretische energielabelverdeling op basis van bouwjaarklasse en de geregistreerde energielabels. Wat opvalt is het geringe aantal indicatieve energielabels G. Dit komt omdat gebouwen voor 1974 zonder geregistreerd energielabel relatief veel voorkomen en het indicatieve energielabel F krijgen. In een deel van deze panden zijn waarschijnlijk geen energiebesparende maatregelen genomen. Dit leidt waarschijnlijk tot een onderschatting van het aantal energielabels G in de getoonde energielabelverdelingen. Voor de berekende verduurzamingsopgave naar energielabel C en A heeft dit geen gevolgen.

In dit onderzoek brachten we geografische- en eigendomsverschillen in de energieprestatie van maatschappelijk vastgoed in beeld. Uiteindelijk bepalen de lokale omstandigheden welke besparingsmaatregelen mogelijk of gewenst zijn. Scholen met een slechte energieprestatie in gebieden die kampen met krimp van de bevolking en leegstand vragen waarschijnlijk om een andere aanpak dan vergelijkbare scholen in de Randstad. In krimpgebieden zal misschien eerder de sloophamer uitkomst bieden, ook als het technisch nog goed mogelijk is om energiebesparende maatregelen te treffen.

Binnen gemeenten met een grote verduurzamingsopgave kan meer gedetailleerde informatie over de locatie, het vastgoed en de eigendomssituatie bijdragen aan het ontwikkelen van een geschikte aanpak. Specifiek kan hierbij worden gedacht aan informatie over de aanwezigheid van geclusterd eigendom of homogene bouwclusters, gegevens over specifieke gebouwkenmerken (bijvoorbeeld grote gebouwen, dakvormen, eigenaren met veel vierkante meters of gebouwen uit een bepaalde bouwperiode). Het meenemen van een beperkt aantal kenmerken- zoals we in dit onderzoek deden- biedt vooral inzicht in die regio's en bij die eigenaren waar gericht onderzoek een toegevoegde waarde kan hebben.

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## 12. RICS

## 12.1. Sustainable real estate and ethics: morals, principles and rules concerning real estate

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### 12.1.1. An introduction

This paper discusses sustainable real estate and the role of ethics within real estate. Both terms 'sustainability' and 'ethics' needs an explanation. With this discussion the tripartite system of 'morals – principles - laws' is described in order to have more grip on sustainable real estate and ethics.

### 12.1.2. Ethics, some cases

In the last decades, The Netherlands have seen a number of large scandals within the branch of real estate. A number of notorious cases should be mentioned. In this paper just three of the most notorious cases will be discussed in short, although, it must be noticed that they are just three of a large number of criminal cases concerning forgery, corruption et cetera within the Dutch branch of real estate. The most notorious case was the so called 'Klimop case' which was discussed in the book 'The Real Estate Fraud' (Boom & Marel, 2009). At the end of 2007, a fraud of unprecedented magnitude comes to light in the real estate world. Top companies such as Philips and Bouwfonds would have been robbed by their own directors. Two directors with their accomplices of the pension funds of Philips and Bouwfonds embezzled these funds for about € 200 to 250 billion. A sample process followed after the shocking facts where exposed. The main suspect Jan Vlijmen argued in the courtroom; *"I have been thinking about what I would say to you here today for three and a half years"*, and *"I have introduced the method within Bouwfonds. But no one has raised his eyebrows."* Another suspect, Nico Vijsma, argued in court; *"I have always been on behalf of Bouwfonds with a shopping note, without knowing exactly what that letter meant. Look, project development is incredibly boring. It gets a bit up thanks to my contribution."*

In the book 'De Ontknoping', in English 'The Denouement', (Boon and Marel, 2012), the motives of these neat businessmen, Vlijmen, Vijsma and top boss Hakstege, about power, the unprecedented love of money and the double standards in business is discussed. At the end, the court sentenced the main defendants for bribery, embezzlement, forgery, and members of a criminal organization. The prime suspect eventually got seven years in prison, his notary four years and other defendants between five and one and a half years (De grootste vastgoedfraudezaak, 2015). Another case is the fall off SNS Reaal (Boon, et al, 2013), SNS Reaal raises hundreds of millions of euros for a takeover event. In this case, SNS bought 50 percent of Bouwfonds, which at the end turned out to be a wasp nest of dubious real estate deals and fraud.

The third notorious case to be discussed, is the case 'Rochdale', where the director of the housing corporation 'Rochdale', mr. Möllenkamp, or his nickname 'mr. Maserati' acted with a megalomaniac and exaggerated luxurious behavior. The court suspected mr. Möllenkamp for perjury, corruption, misuse of credit cards of the Corporation, money laundering, tax fraud and forgery, he eventually got two and a half years imprisonment (Court of Amsterdam, 2015).

In the overall summary of his dissertation 'Material Immaterial', Veuger answered the question whether there are contradictions in the underlying social values of housing corporations that affect the way they are governed (Veuger, 2013). His conclusion is that directors at the highest level in dealing with values, ensure they drive on their own monitor, knowing the consequences and take their responsibility. The consequences might be that love of power, ignorance and other negative attitudes will lead to fraud, corruption and forgery. The panacea would be that society is the main responsible party for the objectives of public housing and that there exist a proper checks and balance system within housing corporations.

### 12.1.3. Ideals, principles and rule

Each of us has his or her own ideals in live. Most of us have the ideal of a healthy and a peaceful live, although these individual ideals differ. As individuals have their ideals, so have governments there ideals which also differ from government to government.<sup>26</sup> This brings us to the following question; what drives us to a certain behaviour? What is the starting point of our behaviour?

In our opinion the starting point are our ideals and with these ideals, a certain behaviour arises. The concept of an ideal can be described as an imagination of something that one hopes to realise. As van der Burg describes *"ideals are values that are implicit or latent in the law, or the public and moral culture of a society or group that usually cannot be fully realized, and that partly transcend contingent, historical formulations, and implementations in terms of rules and principles and policies."*(Van der Burg 1999 p. 176).

Ideals must be regarded as a moral point of departure, they are goals to strive for, used by individuals, divisions of communities as well as the global community. In this way, it can be concluded that the branch of real estate has its own moral starting point with its own ideals to be fulfilled by its own behaviour. Behaving ethically is at the heart of what it means to be a professional. It distinguishes professionals from others in the marketplace. This is what the Royal Institutions of Chartered Surveyors (RICS) promotes. The RICS sets up and maintains the highest professional qualifications and standards in the development and management of land, real estate, construction and infrastructure. RICS created a clear and streamlined set of professional and ethical standards to guide its members and ensures that this set of standards leads to confidence by all parties that deals with RICS members. The RICS developed five standards, RICS members must; demonstrate that they act with integrity, always provide a high standard of services, act in a way that promotes trust in the profession, treat others with respect and take responsibility for their measures and activities.

When ideals are considered on a level of policymaking, such as the RICS policy, the question arises how to convert these moral values into a legal system so that rules can be set up that might help to realise these ideals and to create a protective legal system with enforceable rules for real estate professionals. Dworkin argues that rules give a precise concrete formulation that may include obligations (Dworkin, 1996 p. 35). In order to convert moral values into enforceable rules, however, there must be something else. This 'something else' can be defined as 'principles', as a link between moral values and concrete binding rules. Principles are legal premises that do not necessarily exist in written form, but might provide a general orientation to which positive law should conform (De Sadeleer, 2005 p. 307).

Unlike binding rules in hard law, principles in general include less precise formulations. Principles are vaguer and less explicit than rules, they might be more open to different interpretations, however, they are a suitable instrument for policy-making as well as for law making (De Sadeleer, 2005 p.313). Verschuuren argues that principles themselves do not include enforceable legal duties, they give more insight into the morality of policies and legislative rules. He argues that there is a continuum from theoretical abstract principles on the one end, to very concrete and practical rules on the other hand.

(Verschuuren 2003 p. 25). Principles, should be considered as soft law, as non-binding expressions of commitment. Soft law can be embodied in written documents such as recommendations, declarations and guidelines by heads of States or ministers (De Sadeleer, 2005 p.312). Kiss explains this as follows: *"Soft law can mean formally non-binding expressions of commitment, whereas hard law instruments can be read in treaties and in operative, executive, statements of Conventions"*( Kiss, 2003 p. 69).

Principles might evolve into the body of hard law, but this is not necessarily so the case. Where principles did not evolve in hard binding provisions, but might evolve into upcoming law we can speak about the so-called *lege ferenda*. It must be expressly indicated that not all principles are part of the body of *lege ferenda*. Principles within the body of *lege ferenda* can, as mentioned before, evolve into the body of binding law, the so-called body of *lex lata*. This process of evaluation however, is a continuum in which each principle evolves in its own way. An example of accepting principles as hard binding rules, as evolving from principles into hard law, is formulated in Article 38 (a to c) of the statute of the International Court of Justice, the ICJ.

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<sup>26</sup> One can compare the socialist state of Cuba with its neighbour the USA.



#### 12.1.4. Sustainability as an ideal

Finding a balance between economics and social behaviour might be a challenge. Such a balance leads to economic developments hand in hand with protection of moral standards as part of sustainable behaviour. Nowadays it seems that the concept of sustainability, including sustainable behaviour, is often presented as a panacea for all kinds of problems of various origins. It might be considered that the concept of sustainability is often misused, or at least is misunderstood by organisations as well as by the public.

Therefore, it is necessary to have a clear understanding of the concept of sustainability and sustainable development and its relationship with ethics and legal systems. In 1987 the World Commission on Environment and Development (WCED), also named after its chair, the former Prime Minister of Norway, Gro Harlem Brundtland, stated in its report that *“the ‘environment’ is where we all live; and ‘development’ is what we all do in attempting to improve our lot within that abode. The two are inseparable.”* (WCED, 1978 p. xi) The WCED brought the concerns about human environment and sustainability to the attention of a wider public and defined the term ‘sustainable development’, which leads to the concept of sustainable development (Bugge and Voigt, 2008 p. vii). The Dutch ‘Centraal Bureau voor de Statistiek, (CBS)’ formulated sustainable development as follows;

*“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It encompasses more than care for the environment. Development is sustainable if it also takes into account economic, human and social aspects: scarcity not only applies to natural resources; a highly educated and healthy population, well-functioning social networks, social trust, machines and infrastructure are also not in unlimited supply.”* (CBS, What is sustainability).

In 2002, a United Nations Conference on Sustainable Development (UNCSD) was summoned in Johannesburg. In its Article 1, the declaration stated that *“[the parties] reaffirm our commitment to sustainable development.”* The UNCSD declaration included a political statement, signalling the moral values and intentions of the community of States. The parties at this conference referred to future generations. In its preamble the UNCED stated. In its preamble the UNCED stated

*“[A]t the beginning of this summit, the children of the world spoke to us in a simple yet clear voice [saying] that the future belongs to them, and accordingly challenged all of us to ensure that through our actions they will inherit a world free of the indignity and indecency occasioned by poverty, environmental degradation and patterns of unsustainable development,”.*

Cordonier Segger stated it as follows: *“It outlines the path taken from UNCED to the WSSD (UNCSD) highlights present challenges, expresses a commitment to sustainable development.”* (Cordonier Segger, 2008 p. 107). It might be argued that Member States of the United Nations committed themselves to the ideal of sustainable development. This argumentation can be supported because the above mentioned declarations are signed by the Member States of the United Nations, therefore, by almost every State of the community of Nations.

#### 12.1.5. Ethics, principles and real estate; a conclusion

How about ethics, principles and rules within the branch of real estate? Following the above mentioned theory, the branch of real estate should indicate and describe its ideals, to be followed by its vision on sustainable behaviour, and then to be followed by describing already existing binding provisions within the branch of real estate. In this context, a next step should be undertaken by the organisations of real estate professionals. These organisations should come to a discussion whether principles within the body of *lege ferenda* within the branch of real estate must evolve into the body of *lex lata*, as hard law for real estate professionals, and if so, how these hard binding rules should be formulated. Because if we, as real estate professionals, will be seen by the community as serious sustainable working partners, we should take ourselves seriously, meaning that we must make clear, in a transparent way, what our ideals and principles are and in what way we stated these ideals and principles in hard binding rules for the community of real estate professionals.

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## 12.2. How does sense of security impact on real estate: general review

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### 12.2.1. Abstract

The goal of the study is to answer the question how the sense of security impacts on real estate value. We found out that in general the international literature shows a strong evidence of the effect of crime in large urban areas, particularly on housing prices. The housing and neighborhood quality had an impact on satisfaction with the local physical environment and perceptions of safety. Fear of crime and the direct costs associated with property crime may discourage home-buyers, and catalyze a downward spiral in neighborhood status. A comparison of the results of existing research shows a clear picture of the correlation between real estate prices and the sense of security. Of the seven different types of crime investigate, only robbery and aggravated assault crimes (per acre) exert a meaningful influence upon neighborhood housing values. We assumed that the sense of security in neighborhood is strong connected with level of robbery and aggravated assault crimes. The results show that if the level of this crime is low, then the impact on real estate prices is low (0.1% to 1.0%). We estimate that in the given case the participants would also express a rather high degree of security. In the light of the above, we believe that with measuring the expressed degree safety of participation in observe neighborhood we could predict the impact on the values of real estate. This could help valuers of real estate property values in determining the market values in certain neighborhoods.

**Keywords:** sense of security, real estate value, fear of crime, neighborhoods

### 12.2.2. Introduction

Researchers have long suggested that high crime levels cause communities to decline. This decline may translate into an increasing desire to move, weaker attachments of residents and lower house values (Grum, Kobal Grum, 2015). This is because buyers are willing to pay more for living in neighborhoods with lower crime rates or, alternatively, buyers expect discounts for purchasing properties in neighborhoods with higher crime rates (Ceccato, Wilhelmsson, 2011). Neighborhoods' incidence of violent crime is related to an array of intertwined characteristics, including poverty, segregation, and inequality; collective efficacy, disorder, trust, and institutions; job access; immigration; residential instability, foreclosures, vacancy rates, and evictions; land use and the built environment; neighborhood change; and location of housing assistance (Sackett, 2016). Austin and others (2002) investigated the relationship between neighborhood conditions and residents' expressed perceptions of safety. They found out that neighborhood conditions helped shape attitudes concerning neighborhood crime, but had relied on subjective measures of those conditions. The investigation found that housing and neighborhood quality had an impact on satisfaction with the local physical environment and perceptions of safety.

Fear of crime and the direct costs associated with property crime may discourage home-buyers, and catalyze a downward spiral in neighborhood status (Gibbons, 2004).

In the article we do not deal with enclosed settlements or otherwise protected neighborhoods or gated communities. While historically secured and gated communities were built in the United States to protect estates and to contain the leisure world of retirees, these urban and suburban developments now target a much broader market, including families with children (Low, 2008). This retreat to secured enclaves with walls, gates, and guards materially and symbolically contradicts American ethos and values, threatens public access to open space, and creates yet another barrier to social interaction, building of social networks, as well as increased tolerance of diverse cultural/ racial/social groups (Low, 2007).

In our general review we focus on the impact of crime on property values. All criminal behavior imposes direct costs to the victim and indirect costs to society at large. Our studied effects of crime are the impact that neighborhood crime has on housing values. A major drawback of many studies is that, although crime is undoubtedly endogenous in property value models because of simultaneity, omitted variables or measurement error, the vast majority of studies treat crime measures as exogenous independent variables (Inhlandfeldt, Mayock, 2010). Of the seven different types of crime Inhlandfeldt and Mayock (2010) investigate, only robbery and aggravated assault crimes (per acre) exert a meaningful influence upon neighborhood housing values. So we assumed that the sense of security in neighborhood is strong connection robbery and aggravated assault crimes. Also study of neighborhoods in 22 cities indicates that levels of violent crime in a neighborhood, particularly robbery and aggravated assault, strongly predict residents' perceptions of crime, whereas property crime has little effect (Hipp, 2010). In particular, higher crime or lower safety (perceived and actual) may impede physical activity, particularly in urban neighborhoods (Romero, 2005).

Low local land prices attract low-income residents and, if low-income residents prone to commit crimes in their own neighborhood, we will find more crime in low land-price neighborhoods. Unless we can observe land prices, regression estimates of the impact of crime on property prices will be biased towards finding negative relationship. On the other hand, estimation of the implicit price of crime presents an additional problem. Burglars will target properties where the expected return of the market value of stolen goods is highest. Since high land-price neighborhoods will have high proportions of high-income residents, the returns to in high land-price neighborhoods will be high. We can expect to find burglary rates in these areas; other things equal (Gibbson, 2004).

The article deals with the general sense of security issue and we leave the participants a judgment after expressing a degree of security, no matter what they consider to be security.

### 12.2.3. Real estate value and sense of security

If community psychology is to "understand the multiple influences of the social environment on health and wellness" (Society for Community Research and Action, 2010), then it must consider how people come to feel safe, particularly in disadvantaged areas. The individual-level outcomes of feeling safe (or not) are related to,

and important for, community psychology for a number of reasons. Fear and feeling unsafe are partly the product of the social environmental processes that community psychology studies (Perkins, 2011). Safety can be conceptualized through multiple perspectives and measured in several ways. Areas that have low crime rates enjoy higher property values simply because buyers are more willing to spend for the security that's "promised." When crime rates start climbing, the housing prices start falling because homeowners don't want the added risk.

The sense of security associated with fear of criminality and the causes of this feeling are even more common than crime (Miceli, Roccato and Rosato, 2004). Research in England and the US has shown that fear of crime has a strong impact on the well-being of the population, and that as many as a third respondents feel that they do not feel safe (Meško, Fallshore and Jevšek, 2007). The article focuses on the sense of security in the neighborhood and how it affects the value of real estate. The survey was inspired by data from the European Social Survey (2004, 2005, 2008), which shows that in Slovenia in the last five years the sense of population safety has decreased by as much as 11.7 percent.

Victimization also had an impact on these two variables, but contrary to expectations had no significant impact on satisfaction with people in the local environment when controlling for housing quality (Austin et al., 2002). The degree of victimization (we understand victimology as a science discipline that deals with the study of crime, especially from the point of view of the victim) is significantly higher in urban centers than in the surroundings and in the villages (Meško, 1998). The National Transparent Crime Study of 1983 in the UK showed that 90% of the victims of the robbery were victimized in towns and cities (Meško, 1998).

In the other hand it must be taken into account that the impact of crime on real estate prices may be overstated (Cohen 1990). For instance, neighborhoods with high crime also may experience fewer environmental amenities (close to parks, lakes, playgrounds, good schools, etc.), isolation (poor accessibility), proximity to major highways and transport nodes (with noise and air pollution); industrial land use or commercial/entertainment areas (for example, close to bars, restaurants, pubs). Yet, there are reasons to believe that the impact of crime on residential property prices may also differ among nations since they are contextualized in different forms of capitalism (Ceccato, Wilhelmsson, 2011).

Trček (2005) analyses in greater detail factors such as age, quality of buildings and apartments, neighborly relations and future preferences of respondents. He establishes that regarding dissatisfaction expressed by the surveyed residents in terms of the characteristics of their neighborhood, in the first place they pointed out the issue of parking spaces (60.2% of dissatisfied respondents) whereas high in the list is satisfaction with the neighborhood safety (52.7%) and neighborly relations (56.9%) (Trček, 2005). He therefore notes that the sense of security in a neighborhood is the most important socioeconomic factor. Also Černe and others (2012) find that among Slovenes is a high awareness of the need for a safe environment. For Japan, Cohen and others (2005) also notes that security in the neighborhood is one of the most important socioeconomic factors. Vasovic, Gospavic and Cirovic (2012) found that real estate property and its positive elements, originating directly from the neighborhood of the neighborhood, have the main role in the sale and purchase of real estate in Serbia, for example, playing areas, parking, distance from the city center and feeling of belonging and security in the neighborhood. The sense of belonging to a particular community can help people to more trust their own abilities, thereby reducing the sense of danger of victimization and fear (Meško, Šifrer and Vošnjak, 2012). Some authors also point out the importance of the social situation, since the fear of criminality is borne primarily by those who are in a worse social position, which can be linked to the fact that they do not have the means to protect themselves and their property, in order to move to another environment (McCrea, Shyy, Westen and Stimson, 2005). The reasons for fear of crime should also be sought in environmental influences (Klun, Meško, 2017). In addition to social cohesion Meško and others (2012) found that the shape of the city is also important.

#### **12.2.4. Findings**

Through the literature, empirical works associated with the consequences of residential neighborhood crime have been identified by Olajide and others (2017). Table 1 is presented to give the summary of the related work (Olajide et al., 2017).

Table 1: Analysis of previous studies on consequences of residential neighborhood crime

| Authors (year)                     | Title                                                                  | Purpose                                                                                                                              | Result(s)                                                                                                                                      |
|------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Gibbson (2004)                     | The cost of urban property crime                                       | To examine the cost of property crime on urban settlements.                                                                          | Property crime causes high residential mobility, stigmatization and discourages property investment                                            |
| Pope, Pope (2012)                  | Crime and property values: Evidence from the 1990s crime               | To examine the link between crime and property values by exploring the dramatic, nationwide decrease in crime that occurred in 1990s | he results indicated that negative relationship between crime changes and property value were substantially significant and economically large |
| Crutchfield, Geerken, Gove (1982)  | Crime rate and social integration: The impact on metropolitan mobility | To determinate the impact of property crime on immediate neighborhood                                                                | Neighborhood crime is capable of causing residential mobility and negatively affect social integration                                         |
| Cohen (1990)                       | A note of the cost of crime on victims                                 | To determinate the cost of property crime on residents                                                                               | Property crime increases family budget, causes fear, health hazard and death                                                                   |
| Green, Gilbertson, Grimsley (2002) | Fear of crime and health in residential tower blocks in Liverpool, UK  | To seek to assess the relationship between fear of crime and resident's health                                                       | There are significant associations between fear of crime and health status                                                                     |
| Dugan (1999)                       | The Effect of criminal victimization on a household's moving decision  | To determinate the impact of criminal victimization on a household's moving decision                                                 | The cost included monetary costs on lease-breaking penalties, realty mortgage and transfer tax cost. It can cause emotional and social stress  |
| Anderson (1980)                    | Tge aggregate burden of crime                                          | To estimate all the direct and indirect costs of crime for the entire US nation.                                                     | There were huge loss to the victims as well as the general economy                                                                             |
| Mayhew (2003)                      | Counting the cost of crime in Australia                                | To analyze the cost of crime to the society and government.                                                                          | Cost of acquiring more police increases government budget / expenditure                                                                        |
| Juliliyn, Heydari (2014)           | Crime cost kinds and their assessing                                   | To analyze kinds of crime cost and their assessment methods                                                                          | Crime is capable of increasing government expenditure                                                                                          |

Pope and Pope (2012) compiled information on changes in property values and crime during the 1990s in nearly 3000 urban zip codes throughout the U.S. Using a fixed-effects framework as well as an instrumental variables strategy, their analysis implies a large and statistically significant association between crime and property values. Furthermore, zip codes in the top decile in terms of crime reduction saw property value increases of 7–19% during the 1990s. Both the empirical analysis and a graphical analysis are suggestive that decreasing crime leads to increasing property values (Pope, Pope, 2012).

In yet another report published by the Center for American Progress (Shapiro, Hassett, 2012), it was determined that crime's impact on property values was also substantial. The study concluded that "a 10% reduction in homicides would lead to a 0.83% increase in housing values the following year." Interestingly, before the cut of additional police units (due to the high crime rate, an increased number of police officers were ordered), homes in San Bernardino were valued about 15 percent higher than those in Ontario. But after the cut (and the resulting crime rate increase), the home values in both cities changed to the point that now Ontario's homes are worth about 13 percent higher than its neighboring city, which is located just 15 minutes away.

Gibbons (2004) estimates the impact of recorded domestic property crime on property prices in the London area. Crimes in the Criminal Damage category have a significant negative impact on prices. A one-tenth standard deviation decrease in the local density of criminal damage adds 1% to the price of an average Inner London property. Burglaries have no measurable impact on prices, even after allowing for the potential dependence of burglary rates on unobserved property characteristics. One explanation we offer here is that vandalism, graffiti and other forms of criminal damage motivate fear of crime in the community and may be taken as signals or symptoms of community instability and neighborhood deterioration in general

Ceccato and Wilhelmsson (2011) in their study how the crime impact on apartment prices in Stockholm indicated that apartment prices in a specific area are strongly affected by crime in its neighboring zones, regardless of crime type. When offences were broken down by types, residential burglary, theft, vandalism, assault and robbery individually had a significant negative effect on property values. However, for residential burglary such an effect is not homogenous across space, and apartment prices in central areas are often less discounted by being exposed to crime than those in the city's outskirts. Their findings indicate that if total crime increases by 1 per cent, apartment prices are expected to fall by 0.04 per cent. If residential burglary increases by 1 per cent, apartment prices are expected to fall by 0.21 per cent.

Tita and others (2006) observing housing in Columbus and Ohio. Controlling for structural housing and neighborhood characteristics, housing prices in a low-income neighborhood with one additional violent crime per thousand (level) are on average 1.1 percent lower. Controlling for the same factors a house in a low-income neighborhood with an increase (change) of one more crime per thousand has on average 3.6% lower housing prices. In contrast, housing prices in a high-income neighborhood with an additional violent crime per thousand (level) has on average 0.1 percent lower housing prices and an increase (change) of one more violent crime per thousand has on average 0.05 percent lower housing prices.

In general the international literature shows strong evidence of the effect of crime in large urban areas, particularly on housing prices, little is known about the link between crime and property prices in nonmetropolitan areas. Wilhelmsson nad Ceccato (2015) described the effect of residential burglary on the housing market in a nonmetropolitan municipality in Sweden, using data on property sales in 2005 and 2011. The findings showed that residential burglary has a significant negative effect on property prices in 2011 but no impact in 2005, which might be a result of the dramatic global economic downturn between these years.

Pope's (2008) study finds evidence for use and misinterpretation of the publicly available information on sex offenders. Using a unique dataset that tracks sex offenders in Hillsborough County, Florida, the results indicate that after a sex offender moves into a neighborhood, nearby housing prices fall by 2.3 percent. However, once a sex offender moves out of a neighborhood, housing prices appear to immediately rebound.

Kaliner (2009) found that it can be conservatively estimated that a one percentage point difference in the proportion of newspaper articles about a neighborhood that link it to crime or violence can be associated with a 0.3-0.4 percent difference in the sales price of a home.

Table 2:

| Author(s) (year)               | Location           | Finding                                                                                                                                                                                                    | Range         |
|--------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Pope, Pope (2011)              | US                 | in terms of crime reduction saw property value increases of 7–19% during the 1990s                                                                                                                         | 7.0% to 19.0% |
| Shapiro, Hassett (2012)        | US                 | 10% reduction of homicide lead to increase in housing values for 0.83%                                                                                                                                     | 0.83%         |
| Gibbson (2004)                 | London, UK         | one-tenth standard deviation decrease in the local density of criminal damage adds to 1% the price of an average property                                                                                  | 1.0%          |
| Ceccato, Wilhelmsson (2011)    | Stockholm          | total crime increases by 1% apartment prices are expected to fall by                                                                                                                                       | -0.04%        |
|                                |                    | residential burglary increases by 1% apartment prices are expected to fall                                                                                                                                 | -0.21%        |
| Tita, Petras, Greenbaum (2006) | Columbus, Ohio, US | a low-income neighborhood with one additional violent crime per thousand (level) are on average lower 1%                                                                                                   | -1.0%         |
|                                |                    | a low-income neighborhood with an increase (change) of one more crime per thousand has on average 3.6% lower housing prices                                                                                | -3.60%        |
|                                |                    | housing prices in a high-income neighborhood with an additional violent crime per thousand (level) has on average 0.1% lower housing prices                                                                | -0.10%        |
|                                |                    | residential burglary increases by 1%, apartment prices are expected to fall by 0.21%                                                                                                                       | -0.21%        |
| Pope (2008)                    | Florida, US        | after a sex offender moves into a neighborhood, nearby housing prices fall by 2.3%                                                                                                                         | -2.30%        |
| Kalinger (2009)                | Washington, DC, US | a one percentage point difference in the proportion of newspaper articles about a neighborhood that link it to crime or violence can be associated with a 0.3-0.4% difference in the sales price of a home | -0.3% to-0.4% |

Burnell (1988) as well finds that housing values are adversely affected by crime rates. Benjamin and others (1997) examined the effect of the various security measures on apartment rent and occupancy. Using a sample of apartment complexes from the Washington, D.C. metropolitan area, a simultaneous model of rent and occupancy is estimated with three security measures variables included. Their results show that providing 24-hour security has a positive effect on both rent per unit and occupancy. Providing a manager living on site and having a front desk/restricted entry, however, do not have a significant effect on rent. Increased occupancy occurs with provision of 24-hour security, an on-site manager, and front desk/restricted entry. Thus it appears that, although providing some security is a prerequisite for residency, the landlord cannot extract higher rents. Providing these security measures, however, does increase occupancy (Benjamin, 1997).

As hard as it might be to believe, in certain instances, local crime can actually have a positive impact on real estate prices. This happened in Ontario, CA in 2008 when a neighboring city, San Bernardino, slashed its police force by 13 percent. After the cut, San Bernardino's crime rate rose by an incredible 25 percent (Byloos, 2016). For these reasons, crime prevention and control policy is top of the political agenda in developed countries, particularly in cities, where the problems are acute.



### 12.2.5. Conclusion

The 'fear of crime', whilst not a uniquely urban phenomenon, seems closely related to densely populated and built environments (Bannister and Fyfe, 2001). Although no place is crime-free, there is a clear link between city size and crime (Glaeser and Sacerdote, 1999).

Recommendations for addressing the link between crime and active neighborhood living include championing the importance of addressing this relationship and community partnering with residents and professionals across public health, planning, and criminology, among other disciplines (Kneeshaw-Price, et al., 2015).

A comparison of the results of existing research shows a clear picture of the correlation between real estate prices and the sense of security. Of the seven different types of crime Inhladnfeldt and Mayock (2010) investigate, only robbery and aggravated assault crimes (per acre) exert a meaningful influence upon neighborhood housing values. So we assumed that the sense of security in neighborhood is strong connection robbery and aggravated assault crimes. The results show that if the level of this crime is low, then the impact on real estate prices is low (0.1% to 1.0%). We estimate that in the given case the participants would also express a rather high degree of security.

In the light of the above, we believe that with measuring the expressed degree safety of participation in observe neighborhood we could predict the impact on the values of real estate. This could help valuers of real estate property values in determining the market values in certain neighborhoods.

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### 12.3.      **Attributing a sense of meaning to place: The added value of photovoice in examining intangible aspects of place attachment**

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#### 12.3.1. Abstract

This research paper aims to explore the advantages and limitations of photovoice, a relatively new creative research method, for mapping place experiences. A 'place' is created by people, by attributing a sense of meaning to space, on the basis of their memories, experiences, imaginations, and emotions (Trell & Van Hoven, 2010). To measure these underlying aspects of place, classical research methods will not suffice, as they do not stimulate people to recall experiences. Compared to more classical research methods, photovoice is hypothesized to be a more suitable method for gathering information about people's feelings related to space (Trell & Van Hoven, 2010; Harper, 2002; Deacon, 2000; Hannay, 2013; Wang & Burris, 1997).

In our bottom-up research project in three Dutch villages<sup>27</sup>, we examined the needs of the residents regarding their living environment by using a mixed methods design in which we combined classical methods, such as in-depth interviews, with the creative method of photovoice in order to map livability.

In all villages people were asked to photograph places in their living environment that make them feel at home, involved, proud, (un)safe or (un)satisfied. The photo study consisted of three research phases. During the first phase, participants were asked to take photographs of specific places in the village and in their home related to the above-mentioned aspects. The second phase of the study consisted of a meeting in which the participants together with the researchers commented on and categorized the selected material. In order to analyze the data from an insight as well as an oversight angle, a panel meeting was organized during a third phase in which the categorized data was analyzed by scholars with sociological and spatial backgrounds.

The results of our photovoice studies in the villages imply that this method has a clear added value when mapping people's experiences, emotions and memories regarding their living environment. The results addressed intangible aspects of place, such as the need for autonomy, the identity of the village, belongingness and the feeling of home, that were addressed more clearly than in the in-depth interviews that were held prior to the photovoice studies.

**Keywords:** Creative research methods; Mixed methods approach; Liveability; Small villages; Place attachment

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<sup>27</sup> [www.project-krake.eu/](http://www.project-krake.eu/)

### 12.3.2. Introduction

#### Place attachment

A picture is worth a thousand words is a popular saying for a reason. Therefore, people mapping their living environment by making photographs can be a useful way to examine place attachment. Inhabitants can be given a voice by letting them take pictures of their living environment. In our bottom-up project KRAKE, the residents of three small villages were given a voice by having them take pictures of both positive and negative aspects of their living environment.

Place attachment is a relatively frequently researched topic of which various definitions can be found in the literature (Scannell & Gifford, 2010). According to Scannell & Gifford (2010), place attachment refers to the connection between a person and an important, meaningful space in the built environment, and the person's wish to spend time in this place. When thinking about optimizing people's living environment, it is important to gain insight into the relevant predictors of place attachment and people's experience of place. The experience of place is not only based on the physical characteristics of people's living environment, but also on emotions and memories that people associate with this place.

In the literature, different authors discuss the concept of 'place' and which factors are relevant for turning a space into a 'place' (Tuan, 1975; Trell & Van Hoven, 2010; Cele, 2006; Friedmann, 2010). Trell & Van Hoven (2010) argue that a space is becoming a 'place' by people adding a sense of meaning to space, on the basis of their memories, experiences, imaginations, and emotions. Cele (2006) differentiates between concrete, abstract, and social aspects of place. The concrete aspects of place refer to a physical location, and the way this location is used by people. The abstract aspects of place refer to the emotions that a place can evoke in people, which relate to experiences and memories. The social aspects of place relates to aspects regarding social interaction. Place, from this perspective can be understood as an integral and important dimension of the living environment, created by past experiences and desired futures (Andrews et al., 2007; van Hees et al., 2017; Wiles et al., 2009). In order to map people's experience of place, different aspects of place have to be examined and measured. In addition to the more concrete aspects of place, the more abstract or intangible aspects have to be examined.

#### Research methods for mapping the different aspects of place

The abstract or intangible layers of place are possibly difficult to capture by more classical explorative research methods, such as in-depth interviews and group interviews. After all, it seems complicated to gather data about people's experiences and emotions regarding place, based on their memories, and subsequently transmitted into words. Due to these limitations, new creative research methods, such as photovoice, photo elicitation and video-based research are increasingly applied in recent years, and are hypothesized to be more suitable for mapping the abstract or intangible aspects of place (Trell & Van Hoven, 2010; Harper, 2002; Deacon, 2000; Hannay, 2013; Wang & Burris, 1997). These relatively new creative research methods, which were mainly applied in the social sciences, health sciences, psychology and design research, have received more attention in recent years. This is probably because these methods make it possible for the respondents to be involved in the research process, but especially because these methods seem suitable for mapping people's experiences in a certain context.

Our research aims to examine people's experiences with their living environment in three pilot villages. In addition to more classical research methods, such as in-depth interviews and a survey, that was conducted, the method photovoice was applied in order to explore the more intangible aspects of place. In this study our aim is to explore the added value and the possible disadvantages of the applied creative method photovoice, in examining place attachment.

#### Photovoice

Photovoice is a participatory and explorative method in which respondents can show, represent and strengthen their community (Wang & Burris, 1997). Participants are asked to make photos of objects and places in their community to represent relevant topics related to their personal experiences. This method is used in particular within the field of health and social sciences and during the design process, in which public health issues (in relation to the environment) are explored (Castleden et al., 2008; Fantini, 2017). In addition to identifying topics related to public health, photovoice is expected to be useful in measuring both negative and positive aspects of

place attachment. This assumption is made because the abstract aspects of place attachment refer to experiences, emotions and memories of people regarding their living environment. These 'intangible concepts', such as autonomy or pride, can be difficult to capture in words. Here, photovoice seems to have an added value when compared to more classical research methods, where data is collected on the basis of words instead of pictures. The abstract or intangible aspects of place are expected to be difficult to capture only in words. By letting respondents express themselves with photos or pictures researchers give them the opportunity to demonstrate their perspective on and experience with their living environment.

Wang & Burris (1997) distinguishes three goals when applying the photovoice method. First of all, participants get the opportunity to visually demonstrate the positive and negative aspects of their community. Secondly, photovoice can augment knowledge of important topics within the community and stimulate dialogue between participants. And third, photovoice addresses relevant themes regarding the community to policymakers.

### **Place attachment in small villages: three case studies**

In this paper, we explore the added value of the photovoice method on the basis of three case studies, which are part of our bottom-up project 'KRAKE'. This cross-border research program examines livability in forty small villages. Researchers from Dutch and German educational institutions<sup>28</sup> are working together with local citizen initiatives with the aim of optimizing the livability in these Dutch and German villages. In a select number of these villages the research group Architecture in Health of the HAN University of Applied Sciences and researchers of the Rhine-Waal University of Applied Sciences are focusing on the way we should organize the housing stock and public space to optimize the livability in these small villages.

Livability is a broad concept that is frequently discussed in the literature and different definitions are given (Pacione, 1990; Newman, 1999; Norouzian-Maleki et al., 2015). In this research the definition of Leidelmeijer et al. (2008, p. 14) is used: "Livability is the extent to which the living environment is in line with the conditions and requirements that are imposed by people". These conditions and requirements can refer to both concrete and abstract aspects of the living environment. For example, people can wish for a sufficient range of facilities in their village (concrete), but may also want to be able to assign a clear and unique identity to their village (abstract). Thus, People's attachment to their living environment can form an important part of livability.

In order to examine the level of livability in the three pilot villages, we firstly performed a needs assessment among the villagers that was based on both classical research methods, such as in-depth interviews, and photovoice. This research paper explores the advantages and limitations of photovoice for mapping people's place experience in three villages. Our research questions reads: 1) What aspects of livability in three small Dutch villages are captured by using the method photovoice? And, 2) what is the added value of the research method photovoice in comparison with more classical research methods, in examining people's experience of their living environment?

### **12.3.3. Theory**

#### **Visual research methods**

A growing popularity of visual research methods is seen in the fields of anthropology, sociology, psychology, geography and health sciences (Pain, 2012). Different visual research methods for participatory explorative research are known, such as photo elicitation, photovoice, film elicitation and drawing. Participants are asked to play an active role in the research process and to create part of the data collection by drawing, photographing or filming (Lorenz & Kolb, 2009; Trell & Van Hoven, 2010; Deacon, 2000). Pain (2012) mentions two reasons for choosing visual methods in research, namely: a) the enrichment of the data collection or presentation by visual material, and b) strengthening the relationship between participants and researchers. Her study carefully concludes that especially the first reason is decisive for choosing visual methods in research. In addition, Lorenz & Kolb (2009) argue that within health research visual material collected by the participants themselves can support material generated using more classic methods. Furthermore, it gives the opportunity to compare the experiences of the participants with the data collected by the different stakeholders.

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### **Photovoice compared to other visual research methods**

Some differences can be indicated between photovoice and other participatory visual methods, which have made us decide for this first method in our research project. First of all, photovoice seems to be useful for visualizing the participants' experience of place. A photo can give participants and researchers a more accurate image of a certain place, and therefore less aspects of the place can be forgotten during the subsequent discussion. Supported by the photo, participants are able to explain which aspects of the place are relevant in relation to certain emotions. Secondly, photovoice seems easily executed by the participants in our particular project, in which the participants are in the possession of a mobile telephone with camera. Therefore, participants are able to make the photos in their own time and in their own living environment. Subsequently they are free to select the photos that seems relevant for them. Fourthly, photos with the accompanying comments are easier to categorize and analyze by the researchers than for example videos, which is a time consuming activity.

Several researchers have used and described the method photovoice, introduced by Wang and Burris as a new visual method, and a variant of the visual method photo novella (Wang & Burris, 1997). She mentioned three goals when conducting a study by this method: 1) participants are able to represent the positive and negative aspects of their community, 2) to increase the amount of knowledge of relevant themes within the community of the perspective of its residents and to stimulate debate within the focus groups based on the recollected material, and 3) to expose the outcomes and relevant themes for the community to policymakers. Her approach focuses on mapping the needs of vulnerable groups of people who have difficulties expressing themselves in words, such as rural woman, older adults and homeless people, with the aim to give them a voice (Wang et al., 1998; Baker & Wang, 2006; Wang & Burris, 1997). Although our approach focuses less on giving a voice to vulnerable participants, the method of photovoice seems to be useful in our project for mapping the abstract or intangible aspects of people's experiences in their community, and, to a lesser extent, addressing the outcomes with fellow-residents and policy makers. Van Hees et al. (2017) conducted an explorative photovoice study regarding ageing-in-place in the neighborhood, in which both (older) residents and professionals were asked to make photos of relevant objects and places in relation to ageing-in-place. Here the assumption was made that these people were able to make clear by means of the photovoice method which factors are relevant for facilitating aging in place in the neighborhood. In our research project, we applied a similar method in which we used photovoice for mapping people's experiences with and memories of their living environment.

### **12.3.4. Methodology**

#### **Photovoice in three pilot villages**

The photovoice studies in the three Dutch villages were conducted in the period between November 2016 and April 2018. Two of the villages are located in the province of Gelderland and one in the province of Noord-Brabant and accommodate about 980 to 2700 inhabitants.

Part of the needs assessment among the villagers was the photovoice method in which we examined people's experiences with their living environment, both positive and negative. This method was conducted after performing explorative in-depth interviews or group interviews in the three villages. The combined results of these explorative methods were used as input for the survey that was distributed among all households in the villages.

#### **Three research phases**

In the three villages a total of 60 respondents participated in the photovoice workshop. The photovoice method that we applied in the villages consisted of three research phases: 1) collecting data (making photos) by the participants, 2) a group discussion between participants and researchers on the basis of the photos, and 3) the categorization and analysis of the collected data (photos and comments) by scholars with social and spatial backgrounds. The photovoice workshop was conducted in the three pilot villages in a similar way, although there were (small) differences in the exact method we applied. Our experience with the photovoice method in the first village was used to make small improvements in the method for the following case studies. These adjustments were generally small and related to the precise instruction given to the participants in advance of the workshop, and the categorization of the photos during the workshop, and are explained further in this chapter.

The course and the structure of the workshop were in all case studies similar and proceeded according to the three research stages as described above. During the first phase, in collaboration with the local initiatives, potential participants for the workshop were approached and invited. The participants, who differed in age, gender, household composition, and the number of years living in the village, were recruited by members of the initiative and were handed out on beforehand the instruction. This instruction explained the purpose of the study and asked the respondents to take photos of objects and spaces in their living environment that are related to positive or negative personal experiences. These spots can be defined as places, spaces, buildings, or objects that make them feel at home, involved, proud, (un)safe or (un)satisfied. In the first case study 18 participants were asked to take a maximum of ten photos, of which five in the public space in the village and five in or directly around their own home. The instruction for the participants in the second and third villages was slightly different. In these two case studies respectively 19 and 23 respondents were asked to take a maximum of ten photos of places, spaces, buildings and objects in their village that reflect their experience of the living environment. For example, which objects, buildings or places in the village ensure that:

- You feel at ease
- You feel uncomfortable
- You have fun
- You feel (un) safe
- You feel at home
- You feel like an outsider
- You feel proud
- You are dissatisfied
- You feel connected to the village

The photographs were sent by telephone or e-mail to one of the researchers of the research group. In preparation of the workshop, each image was printed and given a unique code. The second phase of the study consisted of a meeting in which the participants together with the researchers commented on and categorized the selected material. These workshops took place on a weeknight at a location in the village. A short introduction was given by one of the researchers in which the method and purpose of the photovoice workshop was explained to the respondents. Depending on the size of the group, the participants were divided in two or three subgroups. The discussion in each subgroup was led by a researcher with a sociological or architectural background. All participants received an envelope with their own photos (with unique codes). In a subsequent discussion, the participants explained to the researcher and their fellow-participants why a specific photo was taken and what emotions or experiences were related to the location or object that was photographed. In the case that several participants photographed the same location or object, a group discussion took place where experiences were exchanged. In the last two villages where the workshop was held, a ground plan of the village was provided to each subgroup of participants. Respondents were not only asked to discuss their photos, but also to indicate on the map where the photos were taken.

In the third phase of the study, after the photovoice workshop took place, the collected material (photos and comments) was analyzed by experts with sociological and spatial backgrounds. In advance of the expert meeting, the scholars received a file with the photos and related comments. During the meeting the experts were asked to individually examine the collected data and to search for patterns. Subsequently, these individual analyses were compared and discussed in a joint meeting. Based on the output of the expert meeting, a report was written by one of the researchers and reviewed by at least one other researcher. This report was sent to the participants for confirmation.

#### **Possible risks**

When using the photovoice method, just as with the use of other qualitative methods, certain issues have to be taken into consideration. The first issue is that research results of the photovoice method are explorative in nature, and cannot be generalized to the larger population. The aim of this qualitative photo study was to explore the experiences and opinions of the villagers regarding their living environment, without generalizing the research findings. The hypotheses that result from this can subsequently be validated in quantitative research, such as survey research. A second issue with photovoice is that the interpretation and analysis of the collected



material partly is dependent on the subjectivity of the researchers that organize the workshop. We have tried to minimize this subjectivity in the interpretation of the photos and comments, by reviewing all the material with external experts.

### 12.3.5. Results

The findings of the photovoice workshops are presented in this chapter, first separately for each village, and then in a general overview for the three villages together. For each village, we discuss the most important aspects of the living environment that are mentioned by the respondents, both positive and negative. Subsequently, for each village, a comparison is made between the results from the photovoice workshop and results from other types of qualitative data collection, in order to test the expected added value of the photovoice method.

#### Results from the photovoice study: first village

In November 2016, eighteen residents of the first village participated in the photovoice workshop. In the research findings, several themes that directly relate to the living environment emerged, which were frequently mentioned by the participants. During the photovoice workshop, participants frequently selected and discussed photos that are related to social cohesion and places for encountering. In this context, photos of several (sport)clubs, the school and the bakery were selected. Specific locations, such as the entrances of the village, were shown in relation to a feeling of home. Security was a recurring theme on the photos, as several participants were concerned about traffic safety, especially with regard to young children. In contrast, several photographs showed that the respondents feel socially secure. Photographs of buildings and objects of cultural and historical value often were discussed in relation to the identity of the village. Photographs referring to civic initiatives in the village were discussed in relation to feelings of pride and autonomy.



*Figure 1 One of the entrances of the first village.*



*Figure 2 Mosaic of a former school building, photographed by a participant.*

#### Comparison of the photovoice study and in-depth interviewing: first village

In June 2016, semi-structured in-depth interviews with twelve residents of the first village were conducted, who differed in age and gender. Participants were asked about their perception and experiences regarding the livability in the village. A topic list was composed, based on the literature on livability, which served as a guideline during the interviews. The interviews were recorded on tape, transcribed and double-coded by the researchers, and finally approved by the participants. The focus in the in-depth interviews and the photovoice

workshop was similar: an exploration of people's experiences with the positive and negative aspects of their living environment.

When the data from the two qualitative studies are compared, it is noticeable that similar themes are covered in the research outcomes. Themes, such as physical and social safety, social cohesion, and identity, have been addressed in both the in-depth interviews and the photovoice workshop. However, an important difference is that in the photovoice workshop the participants were better able to express their emotions and experiences regarding these themes.

In both qualitative studies, participants mentioned a number of important buildings in the village, such as the Catholic Church, the Reformed Church and the former presbytery. Although during the in-depth interviews, these buildings were associated with intangible aspects, such as pride or identity, these emotions were more clearly expressed in the photovoice study. In the latter, participants explained more about the social and cultural history of these buildings and its reflection in the present living environment. Not only the most iconic buildings in the village were photographed by the participants, but also smaller buildings and objects with a clear cultural and historical value. A concrete example of this is the photograph of the mosaic, which was part of the former Catholic school (figure 2). When the Protestant and the Catholic schools in the village merged and a new school building was realized, this mosaic was preserved and relocated to the schoolyard on the new location. Here the object reflects the fusion of the two denominational schools and thus the fading of a religious divide in the village. Another example is the association of a feeling of home that participants mention in relation to one of the entrances of the village.

The supply and quality of the facilities in the village (e.g. care facilities, commercial facilities, education and public transport) were discussed by the participants in both qualitative studies. However, the findings of the photovoice study made it easier for the researchers to understand how the facilities are used by the villagers. The findings indicated that the different facilities, which often serve a specific target group, are not centered in the village, but are more diffused. This resulted in a discussion between the participants about places in the public space where change encounters take place. Although the participants seem to be satisfied with the supply and the quality of the facilities, a central place in the village, where several facilities are located, seems to be lacking. This can reduce the likelihood of having spontaneous encounters in the public space.

In the photovoice study, certain themes were discussed, that were less often mentioned in the indepth interviews. For example, people's dissatisfaction with the quality and function of several locations in the village. In these cases, respondents were of the opinion that the potential of these locations was not sufficiently utilized in the design of the public space. Another aspect that was addressed more clearly in the photovoice study are locations or objects in the living environment that relate to feeling at home. The participants often associated a 'home feeling' with the design of the entrances of the village.

### **Results from the photovoice study: second village**

In March 2018, nineteen residents of the second village participated in the photovoice workshop. Compared with the photovoice workshop in the first village, the assignment for the respondents in the second and third village was a bit different. In these two villages, participants were asked more explicitly about their emotions regarding locations or objects in their living environment, instead of addressing its positive and negative aspects.

Themes that were frequently addressed in the photovoice workshop in the second village, are social cohesion and social connectedness in relation to specific locations in the village center, such as the meeting center, and the church and parish. Autonomy and involvement were also addressed by several respondents, in relation to citizen participation in community projects and the deployment of volunteers. Respondents proudly mentioned projects in the village that were organized by the villagers themselves, such as the large playground for children and a residential care facility for elderly residents. On the other hand, there was also some frustration and dissatisfaction among the respondents about poorly maintained places in the village that the villagers have no control over.

Safety was also a recurring theme in the photos taken by the participants. Several photographs were taken of unsafe traffic situations or poorly maintained cycling and walking paths. Here, respondents expressed their concerns about the safety of school-age youth who go into traffic and elderly residents with mobility problems.

In the second village, several photographs taken by the respondents addressed the issue of social security. On several locations outside the village center, residents experienced (drug-related) nuisance by young adults on evenings. This is accompanied by feelings of insecurity, by the respondents themselves or by people they know.



*Figure 3 Workshop in the second village. Figure 4 Non attractive location at the entrance of the second village, photographed by a participant.*

#### **Comparison of the photovoice study and the DOP need assessment: second village**

In the second and third village, we compare the results of the photovoice study with the results of an explorative needs assessment: the DOP (village development plan, or in Dutch; dorpsontwikkelingsplan). The DOP is a method for an explorative needs assessment among villagers, performed by a group of active villagers, in collaboration with local policy. The DOP method has been developed by DKK Gelderland, an association on the domain of livability in small villages. With this method, one can explore the needs and wishes of the villagers regarding their living environment. On the basis of the DOP, active villagers gather relevant information and make concrete plans regarding the development of the village in the near future. In 2016, this explorative need assessment took place among residents of the second village. In different meetings, such as brainstorm sessions for which all villagers were invited, and surveys, participants were asked to address important issues related to the livability of the village. Directional questions were asked to the participants to give more guidance, such as 'what are the opportunities and risks with regard to the livability in the village?'. Answers to these question were collected and structured by different workgroups of active citizens, supported by the VKK (Vereniging Kleine Kernen).

To some extent results from the DOP can be compared with results from the photovoice study, as both methods concern an explorative needs assessment of the villagers. However, the focus of both methods is slightly different, as the DOP focused more on mapping the negative aspects, or possible risks, of the living environment. Also, the needs assessment for the DOP is performed by the villagers themselves, and not by external scholars, so that objectivity in the data collection can be less guaranteed.

In both the photovoice study and the DOP, similar themes regarding the living environment were addressed, such as social cohesion, social connectedness, security, civic participation and dilapidation. However, during the photovoice study, some of these aspects have been discussed in a more explicit way, in specific relation to the built environment. For example, during the photovoice study, participants showed a number of buildings in the center of the village which they associated with sociability and connectedness. The 'social value' of these buildings in the village center seemed to be more important than the aesthetic and historical value of these buildings. In the DOP, social cohesion in the village was addressed in a more general way.

Also when discussing themes such as security, autonomy, and dilapidation, the link with the built environment was more pronounced in the photovoice study as compared to the DOP. The duality in the nature of specific locations (friendly and accessible during the day, (socially) unsafe at night) was clearly reflected in the results of



the photovoice study, but not in the results of the DOP. Also, the pride that people feel when they talk about the levels of civic participation and involvement in the village, was clearly related to certain aspects of the built environment in the photovoice study, but not so much in the DOP. Being able to preserve the livability in the village is of great importance to the villagers and results in feelings of pride regarding citizens' initiatives. Also, during the photovoice study, participants discussed photos of the entrances of the village, and referred to a lack of maintenance and even dilapidation. The contrast between these locations outside the village center, and the center of the village, which is experienced as well maintained and attractive, was frequently discussed in the photovoice workshop. Although in the DOP (potential) bottlenecks in the village are mentioned, and possible solutions for the short and long term are suggested, the above mentioned intangible aspects regarding the living environment are less emphasized.

#### **Results from the photovoice study: third village**

In March 2018, twenty-three residents participated in the photovoice workshop of the third village. A distinctive feature of the living environment that was addressed during the photovoice study were places of encounter in the village, such as the meeting center, sports clubs and the church. The historical value of important buildings in the village was frequently discussed, often in relation to intangible concepts as identity and pride. These buildings seem to be directly related to the authentic character of the village, and are considered to be important landmarks in the vicinity. Also the green and natural environment in which the village is located seems to be part of its identity. Several participants discussed the experience of living in a natural and rural environment, both in the center of the village and in the surroundings.

Also more negative aspects of the living environment were addressed in the photovoice workshop. Many photos showed locations that are poorly maintained or even dilapidation in the public space. Just like in the first two villages, traffic safety was an important theme in the photo material collected by the participants. In contrast to the first two villages, only few photos that were discussed in the workshop related to citizens' initiatives and civic participation. Besides a festival, organized by villagers and run by volunteers, local initiatives on the domain of livability were hardly addressed.



*Figure 5 Workshop in the third village.*



*Figure 6 A neglected watercourse in the public space, photographed by a participant.*

#### **Comparison of the photovoice study and the DOP need assessment: third village**

As with the second village, for the third village we also make a comparison between results from the photovoice study and results from the DOP (explorative needs assessment among villagers). However, it is important to notice that the DOP needs assessment has already been held in 2014.

When we compare the results of these two explorative studies, similar themes emerge regarding the livability in the village. Intangible aspects of the living environment are addressed in both the DOP and the photovoice

study, such as the lack of a meeting place in the public space of the village and the need to make specific places in the public space more attractive. However, the relation between livability and specific locations and objects in the built environment is much more pronounced in the latter.

During the photovoice workshop, participants took photos of several buildings in the village, which are, according to them, of great historical and cultural value. There was a clear association with the identity of the village. During the workshop, participants told stories from the past to illustrate the importance of the buildings for the village. Although in the DOP several guidelines are given in order to improve the identity of the village, the experiences of the villagers regarding the identity, and the aspects that have influenced this identity, are hardly discussed.

Also with regard to the themes 'dilapidation of public spaces' and 'the experience of living in a green and natural environment', a similar comparison can be made between the two qualitative methods. Although in the DOP guidelines are given in order to improve the experience of green and the quality of specific public spaces, the experience of the villagers regarding these places, and their location in the village, are hardly discussed.

In the third village, the photovoice workshop seems to be of added value in comparison with the DOP assessment, as it provides more specific information about the factors in the built environment that influence people's (dis)satisfaction.

### **General overview**

Although the results of the photovoice studies in the three villages were quite similar in some respect, we can conclude that the participants in each village address their own specific themes. In the first village, one of the aspects that has been discussed most frequently is the identity and authenticity of the village and also of the villagers. The (social) past of the village, including its religious and feudal history, is reflected in the (built) environment of the village. In the second village, feelings of (un)safety were frequently discussed, especially around the entrances of the village and around public and touristic locations outside of the village. Also, autonomy and civic participation were also frequently mentioned by the residents of the second village, especially in relation to local initiatives in the built environment. In the third village, feelings of dissatisfaction and even frustration regarding the maintenance of the public space can be detected among the villagers. (Spatial) interventions for the improvement of the public space in the village, usually on the initiative of the local government, did not appear to have the desired effect. Due to a lack of maintenance, these locations are referred to as unattractive and undesirable.

### **12.3.6. Discussion / Conclusion**

Looking at the goals of the photovoice study mentioned by Wang and Burris (1997), our application of this method in the three pilot villages especially relates to the first aim: Enabling participants to mention and discuss both the positive and negative aspects of their community, not only in words, but also in images. The second aim of the method mainly took place during the workshops: Increasing the amount of knowledge of the relevant themes within the community, and stimulating debate within the focus groups based on the recollected material. The third aim, to expose the outcomes and the resulting relevant themes for the community to policymakers, was addressed indirectly. The photovoice studies in the three pilot villages were a part of a broader research project in which a mixed method approach has been applied. The results of this broader project have been exposed to and discussed with policymakers in the different villages.

The (intangible) aspects of livability in these three small Dutch villages that were frequently mentioned and discussed in the photovoice workshops are: social cohesion, places for encounter, identity, autonomy, civic participation, security, the experience of nature / green, and dilapidation. These themes were often mingled with emotions of pride, (dis)satisfaction, frustration, and feeling socially involved.

Based on our research findings, we can carefully conclude that the research method photovoice has a clear added value as compared to alternative qualitative research methods. When compared with the more classical research method in-depth interviewing and the explorative needs assessment tool DOP, the photovoice study can be of importance for mapping people's needs and wishes regarding their living environment in three ways. First, in contrast to our expectation, intangible aspects of the living environment are addressed in all explorative studies. However, the photovoice study most clearly demonstrates people's emotions and experiences in

relation to these intangible aspects. Especially, the DOP assessment seems to provide guidelines in order to improve the livability in the villages, but to a lesser extent specify the villagers' experiences of place. Secondly, the research method photovoice can provide new information about people's experiences of space. As the method focuses more on people's emotions regarding their living environment, researchers can obtain a better insight in relevant predictors of place attachment. Thirdly, the method photovoice, in comparison to the other qualitative methods, is useful in matching people's (negative and positive) experiences with their living environment, with the location and distribution of objects, facilities and places in the village. This can support researchers in placing and understanding the needs and wishes people have with regard to the context in which they are living. In summary, we can conclude that the method photovoice can make an important contribution in examining and analyzing (spatial) factors that relate to place attachment, and the emotions that go with it.

One of the main limitations of this study has to do with the comparability of the conducted methods in the three pilot villages, apart from the photovoice method. Only in the first village, the outcomes of the photovoice study could be compared with the outcomes of a qualitative study with a more classical design (in-depth interviewing). As in the other two villages an explorative study was already performed by the villagers themselves, it was not feasible to conduct in-depth interviews prior to the photovoice study. In future research, a systematic comparison between more comparable methods, conducted by the same researchers, in multiple living labs, should be made in order to provide a more realistic image of the added value of the photovoice method in comparison with more classic qualitative research methods.

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## 12.4. Big Data

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Big data is a term used to refer to large, complex data sets which cannot be analysed using traditional data analysis techniques. The use of big data is becoming a key basis of competition and growth for professional firms and it is already affecting every area of business activity including real estate, construction and the built environment.

Spatially referenced big data is impacting every aspect of the surveying profession and chartered surveyors need to understand what big data is, and to engage with its implications. These range from smart cities and intelligent buildings, through to property information relating to construction costs, property markets, land use and valuation data.

Given the size of the data being captured and stored, it is easy to see why the term big data has arisen but there is more to big data than the problem of size. The technical definition of big data commonly includes reference to the *three v's* of volume (terabytes, petabytes or even exabytes - One exabyte is equivalent to 10 billion copies of *The Economist* - of information), velocity (continuously generated data that are analysed in real time or near-real time) and variety (drawn from a number of different data sources). These characteristics have come to typify the standard depiction of big data.

Technicalities aside, there is also a socio-technical dimension that is overlooked by engineers, computer specialists and data analysts who often treat data as being technically neutral. However, data do not exist independently of the ideas, practices, and contexts used to manage or generate them (Kitchen 2014) and big data also raises ethical questions around privacy, and privacy trade-offs, data-sharing, anonymity, security and consent.

The term big data can be used to refer to the data themselves (the origin of the term), or to a collection of digital technologies that support the capture, storage and analysis of big data. These technologies have enjoyed a fast path to technological maturity, an example of combinatorial innovation, and this results in a technology wave that has far reaching implications for business and society as a whole. Previous examples include the petrol engine in the early 1900s, electronics in the 1920s, integrated circuits in the 1970s and the internet itself since the 1990s (Varian 2010).

If big data is being adopted quickly, it is partly due to its underpinning role that has enabled the development of a new generation of disruptive technologies (Christensen 2017). The result can be seen in new tech companies that come from nowhere to revolutionise an industry segment. These digital technologies tap into the emerging shared economy and success is often based on the development and ownership of a platform (Parker, Van Alstynen and Choudary 2017) (e.g. AirBNB, RightMove, Uber, Walulel). Writing about the future of real estate, Andrew Baum terms this area as *PropTech 3.0* (Baum 2017), and he explains that these new technologies will have a radical impact on property, a slow-moving asset class in a conservative industry.

The convergence of big data, blockchain and the Internet of Things (IoT) - See Greengard (2015) for an accessible introduction to the Internet of Things - is of particular relevance for the future of real estate. The IoT is the networked world of connected devices, objects, and people. Blockchain is a decentralised network of digital records (sometimes termed 'ledgers') that link to a particular asset. Together with big data they form part of a trinity that will transform the urban realm and the outlook for the property profession over the next decade.

Other consequences of big data relate to employment. It is predicted that some skills will be replaced through computerisation and the advent of big data. Researchers at the University of Oxford Frey and Osborne (2013) examined nearly 700 occupations and identified which were most susceptible to computerisation. Some occupations were classified as being at high risk of unemployment, based on their potential to be automated over the next decade or two. The research found that those jobs most susceptible to computerisation were generally (not exclusively) those with lower wages and lower educational requirements.



Many occupations relating to the built environment are under threat from big data applications and computerisation; see Thompson and Waller (2017) for an up-to-date analysis of this problem in a surveying context. Jobs with a high degree of specialisation in an area that lends itself to computerisation are at greatest risk (Harkness 2016, chapter 3). Those with higher levels of qualification seem more immune to computerisation, but it has also been suggested that the fields least under threat are those that require more creative intelligence.

One of the central aspects of big data applications derives from the fact that computer systems can access and comb through large volumes of data to answer specific queries. Data that have formed a key part of a chartered surveyor's professional expertise for many years is increasingly moving into the public domain. The publication of property transaction prices makes this information machine searchable and allows machine-learning algorithms to process the data and automate processes that were once the preserve of qualified professionals. Even if an individual professional process cannot be fully automated, it is possible that parts of the task will be automated, thereby reducing the number of qualified professionals required.

Despite the threats posed to certain built environment occupations, RICS members are already in the vanguard of those specifying and adopting Building Information Modelling (BIM) which makes it a good place to start considering how big data is changing the way we work.

BIM is a data driven holistic modelling system that is based on 3D CAD. These data are essentially the specifications and drawings that make up the building model and they are confidential proprietary data, owned by the creator or the building owner. One of the narratives of those promoting big data is the promise of shared and publicly available data but despite the name Open BIM, there is no proposal to open the data for access beyond authorised members of a project team. In fact, there is no obvious reason why private data of this kind should be put into the public domain, and here we see the dichotomy between the growing pool of open data and the equally fast-growing islands of private data generated by the use of BIM and other building level data sources.

Beyond BIM there is also a considerable amount of other private data used by chartered surveyors and other property professionals to manage buildings over their lifecycle. Modern building management systems generate large quantities of digital data from sensors and these are stored and analysed using big data technologies.

Big data is central to the creation of advanced building management systems, which prioritise the efficient use of resources by a building, controlling costs while still providing a high quality internal environment. Data taken from a variety of sources are fed to the building management system, which then determines the best course of action, for example, managing an HVAC system in response to changes in external environmental conditions.

The most advanced systems go beyond simple reactive measures, and include data streams such as short-term weather forecasts and data on a building's thermal properties to improve the energy efficiency of building operation. This has become an increasingly important consideration within built environment professions over the last two decades.

The use of big data is opening new avenues in the way cities may be shaped in the future, as well as generating a better understanding of the components that make up cities, such as buildings and infrastructure. Cities and the built environment represent an overlapping group of complex systems. These range in scale from individual lamp posts or waste bins, to buildings, streets, green spaces, neighbourhoods and communities. They cover urban, national and international networks, including energy, transport, leisure, waste, and water distribution systems. These activities systems represent a wealth of data, which offers the opportunity to improve urban management systems and resource efficiency. The emerging smart cities have the potential to provide a better living environment for urban residents, while simultaneously reducing the environmental impact of the built environment. This arguably makes smart cities the most tangible embodiment of the benefits of big data, and the transformative effect that it will have on human society.

Overall, big data looks set to revolutionise professions throughout the RICS umbrella. It poses a series of challenges, including effective adoption, the potential for job losses in RICS professions, and keeping abreast of developments given the rapid pace of change. On the other hand, it also offers new areas of opportunity as new areas in which to conduct business emerge. It will also revolutionise practice as building data are increasingly

applied to improve efficiencies and make the built environment as a whole more sustainable. As a string of new technologies and data streams are combined, the net result will be a sea change, and it is essential for RICS members to anticipate the future direction of their professions to adapt, and not just continue, but to thrive in the new environment that is emerging.

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## 13. Social Infrastructure

### 13.1. The attractiveness of social infrastructure for older persons in Slovenia

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#### 13.1.1. Abstract

**Purpose** – This paper aims to analyse the impact of the level of community care infrastructure on internal migration. **Design/methodology/approach** – The paper introduces an asymmetric approach to the special case of spatial interaction models to analyse factors that influence migration flows structured by three age cohorts, i.e. cohorts of 0–49 year-olds, 50–74 year-olds, and 75+ year-olds. The model uses publicly available and free databases at the mezzo level in a state. The analysis was performed for inter-municipal interactions of migrants structured by age cohorts. **Findings** – The results show the different influences of analysed factors that influence the migration flows of three cohorts: the distance friction is the highest for the cohort of 0–49 year-olds and the lowest for the cohort of 75+ year-olds. As expected, gross earning is much more important for working population, but the importance of a level of community care (both institutional and social home care) is increasing by aging and is the most important for the oldest cohorts. **Research limitations/implications** – The results show that there are other important factors that influence the migration flows of older persons. Therefore, for better results, other, also more subjective factors should be included in the model. **Practical implications** – The paper gives suggestions for further development of the model to analyze the attractiveness of social infrastructure for older inhabitants and to answer the question about the importance of development of infrastructure for seniors. **Originality/value** – So far, the impact of social infrastructure on attractiveness and stickiness of municipalities has not been addressed by such quantitative methods. In addition to the suggested approach to study the impact of social infrastructure on the wellbeing of the older population, this paper also identifies a need for more in-depth studies on this topic, which will be soon included in our program for research.

**Keywords** Social infrastructure, Migration, Age cohorts, Older inhabitants, Spatial interaction model (SIM), Age management

### 13.1.2. Introduction

Age management is a very fast developing research area, at the intersection of natural and social sciences, humanities and industrial engineering (Bogataj et al., 2017, Battini et al., 2018). The costs of operational activities in age management depend on the appropriate dynamics of building a social infrastructure. On the executive level of the management we have to find the optimal solution for safe and efficient workplaces for working cohorts, the right time to retire for older workers, and a pleasant environment for them. For those who need long-term care (LTC), we have to provide higher accessibility to the services in the built environment, safe lodging and adequately constructed social infrastructure, which always influences costs of services. Slovenian municipalities need additional and enhanced social infrastructure for all generations but primarily to meet the needs of older community members (Mali, 2013, 2014). By 2050, the number of children under 15 years old will decline by more than 20% of this cohort at the beginning of the millennium. Therefore we shall not need more social infrastructure for younger groups. Also, the cohorts under 65 are decreasing in the percentage of total Slovenian population. They especially need better ergonomic conditions in their workplaces (Battini et al., 2017, 2018) or insurance programs that will enable early retirement (Bogataj et al., 2017, Bogataj and Bogataj, 2015). However, the number of people aged 65 and older in EU is expected to double, and the number of people aged 75 and older is projected to triple. This process requires a new form of social infrastructure to be developed, which should be suitable especially for older cohorts. Besides demographic changes, the number of people with chronic diseases, long-term psychological, mental and social distress, handicap and various weaknesses has also increased, which has, in turn, increased the need for long-term help or support in order to improve independence and quality of life (Flaker et al., 2008; Mali, 2013; Leichsenring et al., 2013). Comprehensive systems of LTC will be essential to meet the needs of older people, reduce inappropriate dependence on acute health services, help families avoid catastrophic care expenditures, and free women to play broader social roles (World health organization, 2015).

The majority of EU countries adopted a system of LTC decades ago. An analysis of the functioning of the system (Leichsenring et al., 2013) has shown that, besides formal care-providers, an important role in long term-care is also assumed by informal care workers, especially family members of an individual who needs LTC (Hlebec et al., 2014a, 2014b). The European Quality of Life Survey (Second European Quality of Life Survey – Overview, 2007) shows that in Slovenia 10% of adult population provide care for an older or disabled family member every day or several times a day, on average 12.5 hours per week. The family members are the primary caregivers, as shown in papers of Kogovšek et al. (2003), Albertini et al. (2007) and Hlebec et al. (2014a), but they often use also complementary help of persons from a more formal network of social services, mainly supplied by national (state or community organised) providers.

The question is what kind of housing and other infrastructure do seniors in Slovenia prefer after a substantial decline of their functional capacities, i.e. when they already need LTC services but are still able to live in their current dwelling – in the home where they lived for years together with their families or alone, while they are aware that they need to adapt their home to their functional capacities or to move to a more appropriate home to protect their independence and dignity (Kavšek, Bogataj, 2016, 2017). To adapt their home to their decreasing functional capacities, additional sources could be provided at least partly through reverse mortgage programs (Bogataj, 2013) that should be developed in the near future, or seniors could move to smaller and more accessible housing units. Nevertheless, for providing better built and green environments and services, unfortunately, there is a lack of development proposals that would provide high-quality social infrastructure, and there are no strategic social infrastructure needs assessments available.

The services organized in Slovenian communities are not equally well developed. Different care providers from institutional care in nursing homes, intergenerational centers, community nursing and other kinds of assistance are not organized in all communities, and their level of service provision highly differs from one local community to another (Hlebec, 2010; Hlebec et al., 2014a). There are three formal sectors providing social help for older people: (1) the public sector with its social work centres, homes for older people, centres for assistance at home, and providers of other public services and forms of living, for example, sheltered housing; (2) the private sector, and (3) NGOs and volunteer organisations working with, e.g., the retired people's associations, self-help groups etc. (Mali, 2008a, 2010b, 2011; Hlebec et al., 2014a). The critical studies (Mali, 2008a, 2010a, 2011, 2016; Flaker et al., 2015; Mali et al., 2018) are searching the negative elements of institutional protection that affect the

quality of older people's lives (Mali and Kejžar, 2017). Among the reasons for the emergence of LTC is the process of deinstitutionalization – or the closing of large institutions and restructuring their services into different community services – as it thoroughly transformed the method of providing care (Flaker et al., 2008; Leichsenring et al., 2013, Rafaelič, 2015; Flaker and Ramon, 2015). This has fundamentally changed the long-established models of care provision and drew attention to the right of people to live outside institutions, within a community and with other people, and their right to make independent decisions concerning their lives.

One of the key problems in Slovenia that has been recognised for some time now, and one that obstructs the development of care for older people, is excessive institutionalisation and lack of community-based care. In brief, the care system is rigid and it cannot meet the needs of older people who make up an expressly heterogeneous population group (Mali, 2011). Access to help is a special problem; help is often inaccessible in both urban and rural areas. In the latter, both institutional care (homes for older people) and community-based care (e.g. home help) are often unavailable (Mali, 2012). The reason is that home help is, in most cases, provided by homes for older people, so in places where there are no homes for older people there is no home help either. By contrast, in urban areas the range of available assistance is quite large, but still it does not adequately meet older people's needs (Mali, 2012). Hlebec et al. (2014a) presented an overview on how the care for older people is ensured in the individual community; they obtained the outline of the typology of care.

Based on a multiple hierarchical cluster analysis, where the Ward method was used for standardization of variables, the solution was optimized using iterative k-means clustering (Ferligoj 1989). Hlebec et al. (2014a) analyzed types of care settings across municipalities considering the level of both main ways of care: social home care and institutional care across municipalities, economic (costs and contribution of the municipality to the care), and demographic indicators (the number of residents cared for older than 65 per municipality). They got five clusters as given in Table 1. Based on these data we analysed how the level of development of social infrastructure for older inhabitants influences attractiveness and stickiness of regions for different cohorts (Drobne and Bogataj, 2015, 2017).

*Table 1: Clusters of community care (CC) level in Slovenian municipalities in 2009; adopted after Hlebec et al. (2014a)*

| Municipality         | CC |
|----------------------|----|
| Ljubljana            | 5  |
| Maribor              | 5  |
| Celje                | 4  |
| Koper/Capodistria    | 4  |
| Kostanjevica na Krki | 4  |
| Kostel               | 4  |
| Kranj                | 4  |
| Krško                | 4  |
| Nova Gorica          | 4  |
| Novo mesto           | 4  |
| Beltinci             | 3  |
| Bohinj               | 3  |
| Cerknica             | 3  |
| Črnomelj             | 3  |
| Dobropolje           | 3  |
| Dolenjske Toplice    | 3  |
| Domžale              | 3  |
| Dravograd            | 3  |
| Gornja Radgona       | 3  |
| Gornji Grad          | 3  |
| Grosuplje            | 3  |
| Hrastnik             | 3  |
| Idrija               | 3  |
| Ilirska Bistrica     | 3  |
| Izola/Isola          | 3  |
| Jesenice             | 3  |
| Kamnik               | 3  |
| Kočevje              | 3  |
| Laško                | 3  |
| Lenart               | 3  |
| Lendava/Lendva       | 3  |
| Ljutomer             | 3  |
| Logatec              | 3  |
| Medvode              | 3  |
| Mengeš               | 3  |
| Metlika              | 3  |
| Murska Sobota        | 3  |
| Ormož                | 3  |
| Piran/Pirano         | 3  |
| Poljčane             | 3  |
| Polzela              | 3  |
| Postojna             | 3  |
| Preddvor             | 3  |
| Prevalje             | 3  |
| Ptuj                 | 3  |
| Radenci              | 3  |
| Radlje ob Dravi      | 3  |
| Radovljica           | 3  |
| Ribnica              | 3  |
| Rogaška Slatina      | 3  |
| Rogašovci            | 3  |
| Sevnica              | 3  |
| Sežana               | 3  |
| Slovenj Gradec       | 3  |
| Slovenske Konjice    | 3  |
| Šentjur              | 3  |
| Škofja Loka          | 3  |
| Šmarje pri Jelšah    | 3  |

| Municipality                | CC |
|-----------------------------|----|
| Tolmin                      | 3  |
| Trbovlje                    | 3  |
| Trebnje                     | 3  |
| Tržič                       | 3  |
| Velenje                     | 3  |
| Vipava                      | 3  |
| Vojnik                      | 3  |
| Vrhnika                     | 3  |
| Žalec                       | 3  |
| Žužemberk                   | 2  |
| Žirovnica                   | 2  |
| Žiri                        | 2  |
| Žetale                      | 2  |
| Železniki                   | 2  |
| Zreče                       | 2  |
| Zavrč                       | 2  |
| Videm                       | 2  |
| Velike Lašče                | 2  |
| Velika Polana               | 2  |
| Trzin                       | 2  |
| Tišina                      | 2  |
| Tabor                       | 2  |
| Štore                       | 2  |
| Šoštanj                     | 2  |
| Šmartno pri Litiji          | 2  |
| Šmartno ob Paki             | 2  |
| Šmarješke Toplice           | 2  |
| Škofljica                   | 2  |
| Škocjan                     | 2  |
| Šentrupert                  | 2  |
| Šentjernej                  | 2  |
| Šempeter Vrtojba            | 2  |
| Šalovci                     | 2  |
| Sveti Jurij v Slov. goricah | 2  |
| Sveti Jurij ob Ščavnici     | 2  |
| Straža                      | 2  |
| Starše                      | 2  |
| Središče ob Dravi           | 2  |
| Sodražica                   | 2  |
| Semič                       | 2  |
| Ruše                        | 2  |
| Rogatec                     | 2  |
| Renče Vogrsko               | 2  |
| Rečica ob Savinji           | 2  |
| Ravne na Koroškem           | 2  |
| Radeče                      | 2  |
| Puconci                     | 2  |
| Prebold                     | 2  |
| Pivka                       | 2  |
| Osilnica                    | 2  |
| Nazarje                     | 2  |
| Mozirje                     | 2  |
| Moravske Toplice            | 2  |
| Moravče                     | 2  |
| Mokronog Trebelno           | 2  |
| Mirna Peč                   | 2  |
| Miren Kostanjevica          | 2  |
| Mežica                      | 2  |
| Luče                        | 2  |
| Loški Potok                 | 2  |
| Log Dragomer                | 2  |
| Litija                      | 2  |
| Komenda                     | 2  |
| Komen                       | 2  |
| Kobarid                     | 2  |
| Kanal                       | 2  |

| Municipality              | CC |
|---------------------------|----|
| Juršinci                  | 2  |
| Jezersko                  | 2  |
| Ivančna Gorica            | 2  |
| Ig                        | 2  |
| Hrpelje Kozina            | 2  |
| Horjul                    | 2  |
| Hodoš/Hodos               | 2  |
| Hoče Slivnica             | 2  |
| Grad                      | 2  |
| Gornji Petrovci           | 2  |
| Gorje                     | 2  |
| Gorenja vas Poljane       | 2  |
| Dobrovniki/Dobronak       | 2  |
| Dobrova Polhov Gradec     | 2  |
| Dobrna                    | 2  |
| Divača                    | 2  |
| Cerkno                    | 2  |
| Cerklje na Gorenjskem     | 2  |
| Brežice                   | 2  |
| Brezovica                 | 2  |
| Brda                      | 2  |
| Braslovče                 | 2  |
| Bovec                     | 2  |
| Borovnica                 | 2  |
| Bloke                     | 2  |
| Bled                      | 2  |
| Apače                     | 2  |
| Ajdovščina                | 2  |
| Zagorje ob Savi           | 1  |
| Benedikt                  | 1  |
| Bistrica ob Sotli         | 1  |
| Cankova                   | 1  |
| Cerkvenjak                | 1  |
| Cirkulane                 | 1  |
| Črenšovci                 | 1  |
| Črna na Koroškem          | 1  |
| Destričnik                | 1  |
| Dobje                     | 1  |
| Dol pri Ljubljani         | 1  |
| Dornava                   | 1  |
| Duplek                    | 1  |
| Gorišnica                 | 1  |
| Hajdina                   | 1  |
| Kidričevo                 | 1  |
| Kobilje                   | 1  |
| Kozje                     | 1  |
| Kranjska Gora             | 1  |
| Križevci                  | 1  |
| Kungota                   | 1  |
| Kuzma                     | 1  |
| Ljubno                    | 1  |
| Loška dolina              | 1  |
| Lovrenc na Pohorju        | 1  |
| Lukovica                  | 1  |
| Majšperk                  | 1  |
| Makole                    | 1  |
| Markovci                  | 1  |
| Miklavž na Dravskem polju | 1  |
| Mislinja                  | 1  |
| Muta                      | 1  |
| Naklo                     | 1  |
| Odranci                   | 1  |
| Oplotnica                 | 1  |
| Pesnica                   | 1  |
| Podčetrtek                | 1  |

| Municipality                  | CC   |
|-------------------------------|------|
| Podlehnik                     | 1    |
| Podvelka                      | 1    |
| Rače Fram                     | 1    |
| Razkrižje                     | 1    |
| Ribnica na Pohorju            | 1    |
| Selnica ob Dravi              | 1    |
| Slovenska Bistrica            | 1    |
| Solčava                       | 1    |
| Sveta Ana                     | 1    |
| Sveta Trojica v Slov. goricah | 1    |
| Sveti Andraž v Slov. goricah  | 1    |
| Sveti Tomaž                   | 1    |
| Šenčur                        | 1    |
| Šentilj                       | 1    |
| Trnovska vas                  | 1    |
| Turnišče                      | 1    |
| Veržej                        | 1    |
| Vitanje                       | 1    |
| Vodice                        | 1    |
| Vransko                       | 1    |
| Vuzenica                      | 1    |
| Ankaran                       | n.a. |
| Mirna                         | n.a. |

Notes: (a) Sorted by the community care level and by the name of the municipality in the community care level group. (b) Codes are as follows: 1 - Small, rural municipalities with poor quality of care for older people (no institutional care within the municipality, poorer availability of social home care), 2 - Small, rural municipalities with moderate quality of care for older people (no institutional care within the municipality with moderate availability of social home care as it is also more accessible during afternoons, weekends and holidays), 3 - Larger rural municipalities with balanced quality of care for older people, 4 - Larger rural municipalities with high quality of care for older people, 5 - Ljubljana and Maribor (as the two largest towns in Slovenia). (c) Municipalities Ankaran and Mirna were established after 2009.

### 13.1.3. Methodology

#### Data

All the data used in the analysis refer to the municipalities of Slovenia. The spatial data on the municipalities for 2015 were acquired from the Surveying and Mapping Authority of the Republic of Slovenia (SMARS, 2015). Data on population and gross earnings by municipality for 2015 were acquired from the Statistical Office of the Republic of Slovenia (SORS, 2015). From SORS, data on migration between municipalities in Slovenia according to the age cohorts 0–49, 50–74 and 75+ for 2015 and 2016 were also obtained (SORS, 2016). The shortest time-spending distances in minutes between the centers of municipalities for 2015 were calculated by the Slovenian Roads Agency's (SRA, 2015) data on state roads in ArcGIS 10.5.1. Data on typologies of community care (both institutional and social home care) for old inhabitants in Slovenia were adopted from (Hlebec et al., 2014). Codes denote small, rural municipalities with poor quality of care for older people (no institutional care within the municipality, poorer availability of social home care) ( $CC = 1$ ), small, rural municipalities with moderate quality of care for older people (no institutional care within the municipality with moderate availability of social home care as it is also more accessible during afternoons, weekends and holidays) ( $CC = 2$ ), larger rural municipalities with balanced quality of care for older people ( $CC = 3$ ), larger rural municipalities with high quality of care for older people ( $CC = 4$ ), Ljubljana and Maribor (as the two largest towns in Slovenia) ( $CC = 5$ ). The groups of the municipalities were modelled using 2009 data. Thereafter, two new municipalities were established, namely Ankaran and Mirna. In our analysis, we presumed that the new municipalities had the same community care level as that in the old ones. For description and sources of analysed data see Table 1. The data were introduced in the spatial interaction model (SIM) as the case study; more on spatial interaction models in Haynes and Fotheringham (1984) and Fotheringham and O'Kelly (1989).

#### Spatial interaction model

To estimate the influence of the analysed factors, the spatial interaction model was introduced:

$$M_{ij}^{(t)} = k K(d_{ij})^\beta \prod_r K(r)_i^{\gamma(r)} K(r)_j^{\alpha(r)}, \quad (1)$$

where  $M_{ij}^{(t)}$  was the estimated intensity of migration flows in age cohort  $t$  from a municipality of origin  $i$  to a municipality of destination  $j$ . Age cohorts were defined as follows:

$t = 0-49, 50-74, 75+$ ,  $k$  is the constant of proportionality,  $K(d_{ij})$  is the coefficient of the fastest time-spending distance by state road network between the centre of municipality of origin  $i$  and the centre of municipality of destination  $j$ ,  $K(r)_i$  and  $K(r)_j$  are coefficients of factors  $r$  in origin  $i$  or destination  $j$ , defined as the value of factor in municipality  $i$  and municipality  $j$ , respectively, divided by the average value of this factor in Slovenia, as described in Table 1. Considering the factors that were analysed in the NSIM for three cohorts of migrants, model (1) can be written in detail as:

$$M_{ij}^{(t)} = k K(d_{ij})^\beta K(POP)_i^{\gamma(POP)} K(POP)_j^{\alpha(POP)} K(GEAR)_i^{\gamma(GEAR)} K(GEAR)_j^{\alpha(GEAR)} \cdot K(CC)_i^{\gamma(CC)} K(CC)_j^{\alpha(CC)}. \quad (2)$$

Model (2) was linearized and solved by Microsoft Excel using OLS (Ordinary Least Squares Regression) analysis.



Table 2: Factors in spatial interaction models (1) or (2).

| Notation       | Factor value                                                                                                                                | Additional description                                                                                                                                                                                                                                                                                                                                    | Sources                       |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| $M_{ij}^{(t)}$ | Number of migrants in age cohort $t$ from municipality of origin $i$ to municipality of destination $j$                                     | Sum of yearly values for 2015 and 2016                                                                                                                                                                                                                                                                                                                    | SORS                          |
| $M_{ij}^{(t)}$ | Estimation of the number of migrants in age cohort $t$ from municipality of origin $i$ to municipality of destination $j$                   | The estimation of the real value regarding equations (1) or (2)                                                                                                                                                                                                                                                                                           | Authors' calculation          |
| $K(d_{ij})$    | Coefficient of the fastest time-spending distance in minutes between municipal centre of origin $i$ and municipal centre of destination $j$ | The ratio between the factor value for a pair of municipal centres and the average factor value for Slovenia for 2015                                                                                                                                                                                                                                     | SRA and authors' calculation  |
| $K(POP_o)$     | Coefficient of the number of inhabitants in the municipality                                                                                | The ratio between the factor value for the municipality and the average factor value for Slovenia for 2015                                                                                                                                                                                                                                                | SORS and authors' calculation |
| $K(GEAR_o)$    | Coefficient of gross earning per capita in the municipality                                                                                 | The ratio between the factor value for the municipality and the average factor value for Slovenia for 2015                                                                                                                                                                                                                                                | SORS and authors' calculation |
| $K(CC_o)$      | Code for type of community care (both institutional and social home care) for old inhabitants in the municipality                           | 1 - Small, rural municipalities with poor quality of care for older people<br>2 - Small, rural municipalities with moderate quality of care for older people<br>3 - Larger rural municipalities with balanced quality of care for older people<br>4 - Larger rural municipalities with high quality of care for older people<br>5 - Ljubljana and Maribor | Hlebec et al. (2014a)         |

#### 13.1.4. Results and discussion

In Table 3, the regression coefficients of the linearized model (2) are given according to the age cohorts of 0–49, 50–74, and 75+ year-olds (the values of the regression coefficients where the p-value is higher than 0.025 are in parentheses; detailed statistics are available from authors per request). From Table 3 it is evident that all analysed parameters are statistically significant for cohorts of 0–49 and of 50–74 year-olds, while for the cohort of 75+ year-olds only distance, municipality size according to the number of inhabitants, and the level of community care in the destination are statistically significant. The larger size of a municipality affects emigration with a higher power than it attracts older persons.

Table 3: Regression coefficients and their statistics for cohorts 0–49, 50–74, and 75+ year-olds (inter-municipal migration in Slovenia in 2015–2016).

| Age cohort              | 0–49 years                      | 50–74 years | 75+ years |
|-------------------------|---------------------------------|-------------|-----------|
| R                       | 0.742                           | 0.651       | 0.571     |
| R <sup>2</sup>          | 0.550                           | 0.423       | 0.326     |
| Adjusted R <sup>2</sup> | 0.550                           | 0.423       | 0.325     |
| SE                      | 0.850                           | 0.695       | 0.700     |
| No. of observations     | 13,230                          | 5,728       | 2715      |
| ANOVA stat. F           | 2,312.9                         | 599.7       | 187.4     |
| ANOVA p-value           | 0                               | 0           | 0         |
| Regression coefficient  | Value of regression coefficient |             |           |
| $k$                     | 1.669                           | (0.961)     | 0.790     |
| $\beta$                 | -1.048                          | -0.581      | -0.554    |
| $\gamma(POP)$           | 0.508                           | 0.268       | 0.207     |
| $\alpha(POP)$           | 0.494                           | 0.263       | 0.116     |
| $\gamma(GEAR)$          | 0.273                           | 0.491       | (0.109)   |
| $\alpha(GEAR)$          | 0.379                           | 0.246       | (0.282)   |
| $\gamma(CC)$            | 0.135                           | 0.185       | (0.045)   |
| $\alpha(CC)$            | 0.155                           | 0.192       | 0.312     |

Notes: (a) The values of the regression coefficient where  $p$ -value > 0.025 are in parentheses. (b) Detailed statistics are available from authors per request.

The distance friction effect is the highest for the youngest cohort (-1.05), but it is just a half of this for older (-0.58) and the oldest cohorts (-0.55): younger ones migrate much more over short distances, but for older cohorts, migration distance is less important regarding their decision about migration. The population is, again, the most important for the younger cohort, but older and the oldest cohorts are not influenced by population like younger ones. In general, the stickiness of population in the origin municipality is higher than the attractiveness of the population in the destination municipality. This difference is the highest for the oldest cohort, where the stickiness of the population is almost double the attractiveness of the population: older inhabitants in the 75+ cohort who live in larger towns stay there, in general. The impact of gross earnings is statistically significant for the cohorts of 0–49 and 50–74 year-olds, but it is not important/significant for the oldest cohort of 75+ year-olds. Higher impact of gross earnings was registered for the cohort of 0–49 year-olds in the destination and for the cohort of 50–74 year-olds in the origin. This means that higher gross earning attracts the younger cohort, but it retains the mid-cohort. From the results in Table 3, it is also evident that the level of community care in a municipality is much more important for the cohort of 50–74 year-olds and for the oldest cohort than for those who are younger than 50 years-old. However, the impact of the level of the community care in the destination is the highest for the most aged migrants.

The significance of spatial interaction models is high enough (ANOVA  $p$ -values are 0 for all three cohorts), but the adjusted R<sup>2</sup> decreases from 55% for the cohort of 0–49 year-olds, to 42% for the cohort of 50–74 year-olds, and to 33% for the cohort of 75 year-olds and more. The last result shows that there should be other factors that influence the migration flows of the oldest cohort.

### 13.1.5. Conclusion

The paper deals with the question how social infrastructure can improve attractiveness and stickiness of municipalities, enabling better and less expensive operative part of age management and therefore higher quality of life for various cohorts of inhabitants. As this paper shows, influences differ substantially among different cohorts. Thus we assumed that the age management and the social infrastructure that support this management should be considered separately for those employed (depending on the infrastructure for them and their children) and those retired, especially those being in LTC. The research was based on the following assumption:

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while for the first group of members of a community there is essential accessibility to well-paying jobs, good kindergartens and schools, for retired inhabitants and those with significantly declined functional capacities there are essential services for older inhabitants based on the well-developed infrastructure for seniors, where age management in medicine and LTC should present a comprehensive, scientific approach to older persons. However, to achieve more sustainable economic and social development, we have to follow some EU targets.

In this paper, we analysed the impact of accessibility to the new municipality as well as the impact of the level of community care infrastructure on internal migration. We introduced an asymmetric approach to the special case of the spatial interaction model (SIM) to analyse factors that influence migration flows: distances between municipalities (the fastest time-spending distance between a municipal centre of origin and a municipal centre of destination), the number of inhabitants in the municipalities, the gross earnings per capita in the municipalities and the developed level of LTC infrastructure. The migration groups were structured by three age cohorts, i.e. cohorts of 0–49 year-olds, 50–74 years-olds, and 75+ year-olds. The results show that all these factors affect the three analysed age cohorts differently. The impact of distance is the highest for the cohort of 0–49 year-olds and the lowest for the cohort of 75+ year-old inhabitants. As also expected, gross earning is much more important for the working population, while it does not influence the destination of the 75+ group. The focus was on the impact of development of social infrastructure on community care. While the transportation infrastructure is the most important for the 0–49 cohort, by ageing the development of LTC is the most important and reaches the highest value in destinations of the oldest cohorts. The adjusted R<sup>2</sup> of the model decreases from 55% for the 0–49 cohort to 42% for the 50–74 cohort and 33% for the cohort of 75+ year-old persons. The impact of the level of development of social infrastructure was highly significant especially for older cohorts, but the result suggests that other factors that influence migration flows should also be analysed and could make local areas more attractive and more sticky.

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## 13.2. Assisted Living Facilities System Development: The Case of Slovenia

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### 13.2.1. Abstract

**Problem Statement** – Ageing population is a global trend that significantly impacts the provision of various care services for elderly people. Slovenia and its municipalities are today overwhelmed with applications of elderly people that require institutionalized care services as in July 2018 there are approximately 7,200 people waiting to be accepted for care services in institutionalized care. However, assisted living facilities and / or adjustments to an elderly friendly environment are nowadays becoming viable alternatives to the ones of the primary system focused on institutionalized care from the views of care funding bodies as well as its users – older people.

**Purpose** – The purpose of this paper is to present the chronological system development in assisted living facilities in Slovenia in recent years, and subsequently to identify existing challenges in reducing the surplus of demand for institutionalized care.

**Design/Methodology/Approach** - An in-depth literature review of existing secondary sources, next to the case study of assisted living facilities in Slovenia are used to examine the current state of assisted living facilities and to provide an in-depth elaboration in challenges remaining in this specific field, especially focusing on the legislative and funding aspects that are discussed on the national level.

**Findings** – The findings reveal the high importance of appropriate legislation in providing care services, where in Slovenia there is the need of formally adopting the law on long-term care. The findings also reveal the need for a systematic approach to funding of various forms of care, namely institutionalized care and deinstitutionalized care.

**Discussion and Conclusions** – Care services system still needs important improvements, as the existing system, which was primarily in the past focused mostly on funding institutionalized care services for elderly people, has proven to be ineffective, unable to satisfy all of its demand. We therefore propose reorganization of the existing funding, organizational and other capabilities to provide an overall better organized system for satisfying the rising and ever changing needs of Slovene elderly population.

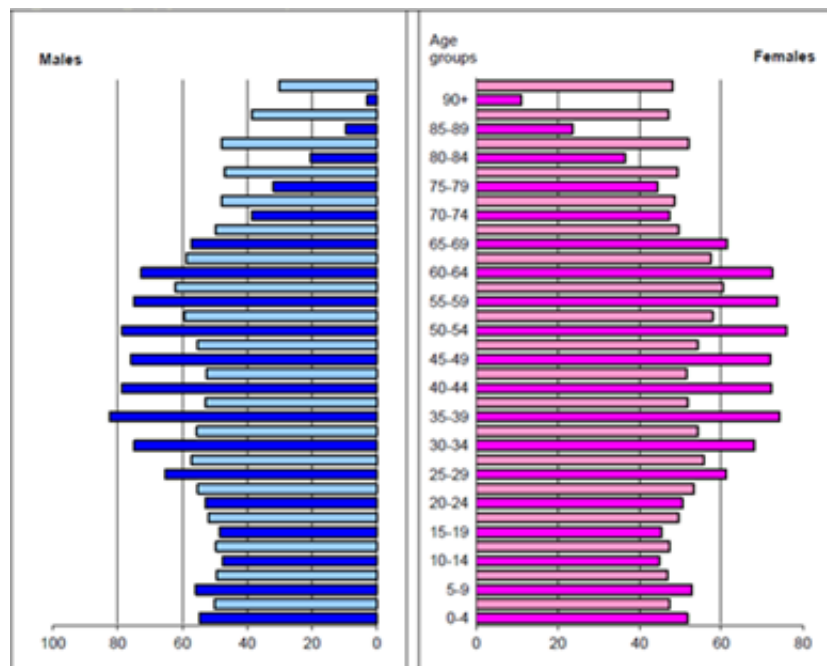
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**Keywords:** Assisted living facilities, Care services, Ageing population, Long-term care, Funding, Reorganization

### 13.2.2. Introduction

Ageing population is a global trend, where European Commission (2018) adds that the working age population (15-64) in the European Union (hereinafter EU) will decrease from 333 million in 2016 to 292 million in 2070. Moreover, the old-age dependency ratio (people aged 65+ relative to those in the 15-64 group) is going to increase by approximately 21.6 percentage point, from 29.6% in 2016 to 51.2% in 2070. Specifically, the EU in 2070 will have only 2 working aged persons for every 65+ person, which is a significant decrease from 3.3 working age persons for every person 65+ in 2016. The impact of ageing is going to be problematic or at least challenging for almost all member states, as the total cost of ageing (i.e. public spending on pensions, health care, long-term care, education and unemployment benefits) is expected to increase by 1.7 percentage points to 26.7% of gross domestic product (hereinafter GDP) between 2016 and 2070. According to the Ministry of Finance of the Republic of Slovenia (2017) the share of older people in Slovenia will rise significantly as there will be 46.9% more people in the elderly group (65+) in 2070 compared to 2016 and 19.6% less people in the active age (15-64 years old). Similarly, the age-dependency ratio has been rising rapidly in recent years, due to the declining number of working-age people and a rising number of the elderly population. Dimovski & Colnar (2017) argue that in Slovenia it is important to increase the older workers' employment rate, due to its positive effects on the whole society and at the individual level. In figure 1 authors show the Slovene age pyramid comparison for 2016 vs 2070:

Figure 1: Age pyramid comparison: 2016 vs 2070



Source: EUROSTAT and Commission Services, in Ministry of Finance (2017).

Therefore the purpose of this paper is to present the chronological system development in assisted living facilities, long-term care and social system in Slovenia, and use this as a starting point in identifying existing challenges in promoting solutions for assisted living facilities and at the same time tackling challenges related with reducing the surplus of existing demand for institutionalized care.

### 13.2.3. Long-term care and assisted living definition

European Commission (2018) defines long-term care based on definitions adopted by organizations such as Organization for Economic Co-operation and Development (hereinafter OECD), Statistical Office of the European Union (hereinafter EUROSTAT) and World Health Organization (hereinafter WHO) as “a set of services required by persons with a reduced degree of functional capacity (physical or cognitive) and who, as a consequence of this, are

*dependent for an extended period of time on help with basic and / or instrumental activities of daily living.”*

European Commission (2018) also argues that long-term care expenditure is an important and growing share of GDP and of health spending (where they include public and private spending). Future trends in long-term care are likely to be heavily influenced by population ageing and thus represent an important factor for the long-term sustainability of the public finances.

Assisted Living Quality Coalition (1998) defines assisted living as “a congregate residential setting that provides or coordinate personal services, 24-hour supervision and assistance (scheduled and unscheduled), activities, and health related services; designed to minimize the need to move; designed to accommodate individual residents’ changing needs and preferences; designed to maximize residents’ dignity, autonomy, privacy, independence, and safety; designed to encourage family and community involvement (p. 4).”

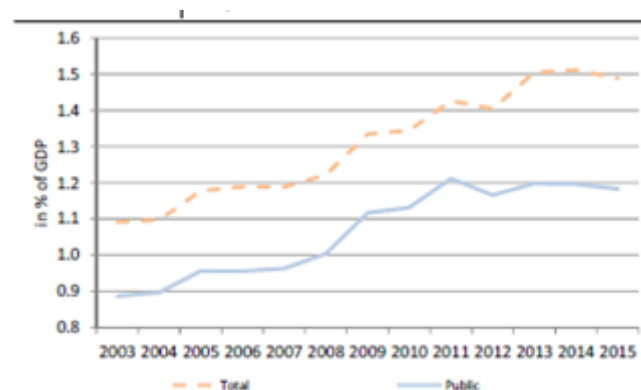
#### 13.2.4. Case study Methodology

Due to the informative and exploratory nature of this paper, we decided to adopt a single case study approach based on an in-depth literature review. Case study is advised when an in-depth understanding of the context is important. It is recommended for answering the why question, as well as the what and how questions (Saunders, Lewis & Thornhill, 2009); specifically, it is appropriate for conducting descriptive research designs, for example, what is happening (Yin, 2003), as is the case with this study. Regarding the single case study approach, Eisenhardt (1989) argues that there is no ideal number of cases. “A case study is a history of past or current phenomenon, drawn from multiple sources of evidence. It can include data from direct observation and systematic interviewing as well as from public and private archives. In fact, any fact relevant to the stream of events describing the phenomenon is a potential datum in a case study, since context is important (Leonard-Barton, 1990).”

#### 13.2.5. The case of Slovenia

To describe the context of long-term care in Slovenia, authors present in figure 2 the long-term expenditure increase in the EU as % of GDP from 2003 to 2015, where this trend is expected to continue in the future.

Figure 2: Public and private long-term care expenditure in the EU, as % of GDP



Source: European Commission (2018).

European Commission’s ageing working group prepared a detailed reference scenario that projects long-term care spending as % of GDP and projects the number of recipients of long-term care, which are distributed in 3 different categories, namely receiving institutionalized care, receiving home care and receiving cash benefits. Data for Slovenia and a comparison with the EU-28 that suggest that Slovenia is below average are presented in table 1:

Table 1: Long-term care spending as % of GDP Slovenia vs. EU-28 and number of recipients of long-term care Slovenia vs EU-28 (2016-2070)



|                                                        | <b>Change<br/>16-70</b> | <b>2016</b> | <b>2020</b> | <b>2030</b> | <b>2040</b> | <b>2050</b> | <b>2060</b> | <b>2070</b> |
|--------------------------------------------------------|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Slovenia – long term care spending as % of GDP</b>  | 0.9                     | 0.9         | 1.0         | 1.1         | 1.4         | 1.7         | 1.8         | 1.8         |
| <b>EU-28 – long term care spending as % of GDP</b>     | 1.2                     | 1.6         | 1.7         | 1.9         | 2.2         | 2.5         | 2.7         | 2.7         |
| <b>Slovenia – recipients of institutionalized care</b> | 84%                     | 35          | 38          | 45          | 55          | 61          | 64          | 65          |
| <b>EU-28 –recipients of institutionalized care</b>     | 74%                     | 5,402       | 5,706       | 6,542       | 7,621       | 8,672       | 9,258       | 9,377       |
| <b>Slovenia – recipients of home care</b>              | 89%                     | 34          | 37          | 44          | 54          | 61          | 64          | 65          |
| <b>EU-28 – recipients of home care</b>                 | 81%                     | 7,068       | 7,531       | 8,829       | 10,357      | 11,735      | 12,555      | 12,817      |
| <b>Slovenia – recipients of cash benefits</b>          | 73%                     | 42          | 45          | 52          | 61          | 68          | 72          | 73          |
| <b>EU-28 – recipients of cash benefits</b>             | 63%                     | 10,554      | 11,140      | 12,677      | 14,389      | 16,054      | 16,879      | 17,229      |
| <b>Slovenia – total recipients of long-term care</b>   | 81%                     | 111         | 120         | 141         | 170         | 190         | 199         | 202         |
| <b>EU-28 – total recipients of long-term care</b>      | 71%                     | 23,023      | 24,376      | 28,048      | 32,367      | 36,461      | 38,693      | 39,423      |

Source: European Commission (2018).

Nagode et al. (2014) add that in every country long-term care is a mixture of health services and social care services. In general, the demarcation between health work and social part of long-term care remained more or less the same as it was set up in 2006 by OECD, Eurostat and WHO. According to the 2006 demarcation, the health part of long-term care consists of long-term medical and nursing care, personal care and services associated with basic daily activities assistance. All other services, related with only help with daily support tasks fall under the category of social work in long-term care. Demarcation between health work and social care services in long-term care is presented in table 2:

Table 2: Demarcation between health work and social work in long-term care

| <b>Demarcation</b>                                         | <b>Medical and nursing care</b> | <b>Basic daily activities</b> | <b>Daily support activities</b> | <b>Other social work services</b> |
|------------------------------------------------------------|---------------------------------|-------------------------------|---------------------------------|-----------------------------------|
| <b>Long-term care - health part</b>                        |                                 |                               |                                 |                                   |
| <b>Long term care - social part</b>                        |                                 |                               |                                 |                                   |
| <b>Partially outside the demarcation of long-term care</b> |                                 |                               |                                 |                                   |

Source: adopted from SHA (2011); Nagode et al. (2014).

### **Social system, social infrastructure and development of assisted living facilities in Slovenia**

The main goal of social protection in Slovenia is to ensure dignity and equal opportunities and to prevent social exclusion. The role of social work centers in the whole social protection system is crucial as they are seen as integrators of the entire system. Their role in communities is gaining importance and is continuously stronger, as they are facilitators of new programs and new forms of activities that are adapted to the current needs of the environment. Furthermore, they carry out a number of programs for users that are not offered by any other provider in their local environment. They discover new problems and develop new forms of action through individual projects and programs (Ministry of Labor, Family, Social Affairs and Equal Opportunities, 2017).

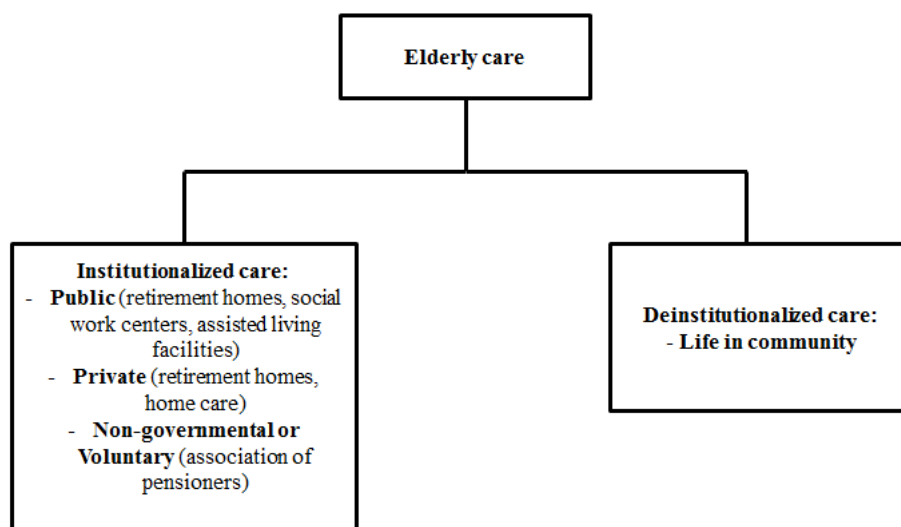
Social infrastructure can be described as “re-distributional” services, which is a term that refers to all facilities that need to be generated to citizens for the purpose of bridging gaps in inequalities. In general those are services that all people should have access to regardless if they are able to pay for them or not (Lang, 1992). Social infrastructure should be designed to efficiently meet peoples’ needs at all stages of their lives (London Plan, 2015). Primary components of re-distributional or social infrastructure are education, healthcare, and affordable housing. Also highly important are intangible or soft infrastructure such as support services, network or relationships that provide social safety nets, and social security like insurance and services for the elderly and special needs groups (Wai et al., 2012). An additional category of social infrastructure is recreational and cultural facilities.

In Slovenia due to fragmented system of financing long-term care, a meaningful first step is to create an uniform system of financing long-term care. An integral part of long-term care system, are also informal care providers, which are according to OECD the backbone of every long-term care system (Drole & Lebar, 2012). Žibret (2018) estimates that there are approximately 200,000 informal care providers in Slovenia. Responding to the changed age structure of the population, it is important to create an economic and social environment that takes into account the needs of all generations and enables the elderly to live independently and actively (Institute of Macroeconomic Analysis and Development, 2017). In Slovenia the vast majority of the elderly population desires to live at home at an old age, and to live with dignity and quality. Bogataj, Ros-McDonnell & Bogataj (2016) add that the elderly population need age-friendly facilities and amenities that enable them to keep their independence and that support their mobility. On the national level, such facilities must be planned in planning procedures. However, compared to other countries, Slovenia has a less developed home care sector, where in 2014 the share of home care recipients in Slovenia was 6.5%, compared to the OECD in 2013 which was 8.9%. In order to progress in the field of home care, adjustments in the economy are necessary and moreover key adjustments need to be promoted in living conditions and transport infrastructure, where all adjustments should include advanced technological solutions (Institute of Macroeconomic Analysis and Development, 2017).

### **Institutionalization and deinstitutionalization**

The strategic development program (1999) of organized care for the older population in Slovenia divides the history of development of organized care in four periods. The first period contains development of organized care from its initial beginning to the end of World War II. The second period is from the end of World War II until the establishment of the Fund for construction of housing and retirement homes in 1972. The third period is from 1972 until 1992, when the law on social protection was formally adopted and the fourth period is from 1992 until today. Authors present the existing possibilities for elderly care in Slovenia in figure 3:

Figure 3: Elderly care in Slovenia in 2018



Hlebec and Mali (2013) add that in Slovenia services and programs for the elderly that provide help with their day-to-day activities and tasks, also called formal forms of assistance exist in three sectors of social protection, namely in the public sector (social work centers, retirement homes, assisted living facilities, etc.), private sector (retirement homes and home care), and non-governmental and voluntary organizations (i.e. association of pensioners). Opposite to the institutionalized care, there is the trend of deinstitutionalization, where Flaker and Ramon (2016) define deinstitutionalization as the process of closure of total institutions, while simultaneously creating services that have the potential to support people in distress and enable them to live as ordinary life as possible in the community. Rafaelič (2015) adds that we do not today discuss deinstitutionalization only because of its ethical and practical reasons, but also because it is indirectly and directly dictated by numerous human rights declarations and other international and national documents.

#### Legislation in the Slovenian Social System

Legislation that is important for the functioning of the social system including assisted living facilities in Slovenia is represented in table 3:

Table 3: Legislation in Slovenia related to the social field (assisted living facilities)

| ID | Law and number                                                            | Content                                                                                                                                                                                                                                                                                                                                                      | Effective Date | Amendments and supplements             |
|----|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------|
| 1  | <b>Act on Social Care of Persons with Mental and Physical Impairments</b> | Regulates forms of social protections of moderate, heavy and severely mentally and physically disabled persons, who cannot be trained for independent life and work, and where it is established that the disability resulted in the child's youthful age prior the age of 18 or during regular involvement in the schooling system but until the age of 26. | 01/07/1984     |                                        |
| 2  | <b>Employment and Insurance Against</b>                                   | Act shall be governed by employment, unemployment insurance, management system and                                                                                                                                                                                                                                                                           | 02/16/1991     | 03/28/1992<br>01/14/1994<br>07/15/1994 |

|           |                                                    |                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                                                                                                    |
|-----------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <b>Unemployment Act</b>                            | method of implementation of professional tasks in the field.                                                                                                                                                                                                                                                                                                |            | 10/24/1998<br>08/10/2002<br>07/28/2006                                                                                                                                             |
| <b>3</b>  | <b>Health Care and Health Insurance Act</b>        | Regulate the system of health care and health insurance, regulate the public providers of health and their tasks, health care in connection with work and working environment and regulate the relationship between health insurance and health institutions and exploitation of rights based on health insurance.                                          | 03/01/1992 | 03/13/1993<br>03/02/1996<br>04/25/1998<br>01/30/1999<br>12/22/2001<br>07/11/2002<br>01/02/2004<br>09/01/2005<br>04/12/2006<br>10/09/2007<br>08/24/2008<br>11/17/2011<br>11/06/2013 |
| <b>4</b>  | <b>Pension and Disability Insurance Act</b>        | Regulates the compulsory pension and disability insurance, a compulsory supplementary pension insurance scheme and voluntary supplementary pension insurance.                                                                                                                                                                                               | 04/01/1992 | 01/01/2000<br>01/01/2013                                                                                                                                                           |
| <b>5</b>  | <b>Social Assistance Act</b>                       | Prevention and resolution of social problems of individuals, families and groups.                                                                                                                                                                                                                                                                           | 11/13/1992 | 01/30/2004<br>10/27/2006<br>07/28/2012<br>06/18/2016<br>06/24/2017                                                                                                                 |
| <b>6</b>  | <b>War Veterans Act</b>                            | Regulates the right to protection under this law in a war veteran when he reaches 55 years of age or when it caused permanent total loss of working capacity.                                                                                                                                                                                               | 01/01/1996 | 01/11/2000<br>08/19/2003<br>04/26/2006<br>05/20/2014                                                                                                                               |
| <b>7</b>  | <b>War Disability Act</b>                          | Regulates the field of war invalids.                                                                                                                                                                                                                                                                                                                        | 01/01/1996 | 04/19/1997<br>12/20/1997<br>04/01/2014                                                                                                                                             |
| <b>8</b>  | <b>Parental Protection and Family Benefits Act</b> | Regulates insurance for parental protection of and the rights deriving therefrom, family benefits, conditions and procedures for exercising individual rights and other issues relating to the implementation of this act.                                                                                                                                  | 01/01/2002 | 08/19/2003<br>05/24/2006<br>01/31/2008<br>04/14/2014<br>01/01/2016<br>03/17/2018                                                                                                   |
| <b>9</b>  | <b>Employment Relationship Act</b>                 | Regulates employment relationships that are concluded with a contract of employment between the worker and the employer.                                                                                                                                                                                                                                    | 01/01/2003 | 04/12/2013                                                                                                                                                                         |
| <b>10</b> | <b>Social Assistance Benefits Act</b>              | Regulates the right to social assistance and the right to social security benefits, beneficiaries or beneficiary under this act, the conditions for eligibility for social assistance and social security benefits, their height, the allocation period, the method of coordination and payment, assessment procedure unduly received social assistance and | 08/10/2010 | 05/28/2011<br>03/02/2013<br>12/04/2013<br>11/28/2015<br>12/31/2016<br>05/05/2018                                                                                                   |

|    |                                                               |                                                                                                                                                                                                                                                                                                                                                                          |            |                                                                                                |
|----|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------|
|    |                                                               | its consequences, financing, monitoring and collection of data.                                                                                                                                                                                                                                                                                                          |            |                                                                                                |
| 11 | <b>Exercise of Rights from Public Funds Act</b>               | Law defines the types of cash benefits, subsidies and payments, to be decided under this Act, the income limits are taken into account in the exercise of their rights by public funds, which are dependent on material status, single method for determining material position, the amount of certain rights from public funds and the procedure for their enforcement. | 08/14/2010 | 05/28/2011<br>03/02/2013<br>12/04/2013<br>08/15/2015<br>11/28/2015<br>01/14/2017<br>12/23/2017 |
| 12 | <b>Employment, Self-employment and Work of Foreigners Act</b> | Act lays down the conditions of employment, self-employment and work of foreigners and the related tasks of the Republic of Slovenia for the regulation and protection of the labor market.                                                                                                                                                                              | 07/15/2015 | 11/11/2017<br>05/04/2018                                                                       |
| 13 | <b>Law on Long-term Care (Proposal)</b>                       | Establishment of a comprehensive and integrated system of long-term care with emphasis on home care.                                                                                                                                                                                                                                                                     | In process |                                                                                                |

Source: Legislation (2018).

First there are laws that are important for regulating labor relations and labor rights, presented in table 3 with id numbers 4 and 9. Second there are laws that regulate the labor market and employment, presented in table 3 with id numbers 2 and 12. Third, in Slovenia there is no commonly valid uniform definition of long-term care, nor is the area systematically regulated (absence of special law for long-term care). Therefore, long-term care is currently governed by multiple laws and regulations, presented in table 3 with id numbers 1, 3, 5, 6, 7, 8, 10, 11 and 13 (Nagode et al., 2014).

Long-term care in general is one of the areas that in the context of social policies in economically developed countries and has been gaining in recognition. Since 2002 in Slovenia a lot of effort and activities were devoted in formally adopting the law on long-term care, however in 2018 such a law is still not adopted (Ministry of Health, 2017). Specific attempts to adopt the long-term care law were unsuccessful in 2002, 2010 and in 2017 as there were numerous contradictory opinions and lot of misunderstanding between stakeholders in the field. With the absence of such a law, Slovenia is some 25 years behind in the development of long-term care in comparison with some developed European countries (Žibret, 2018). The absence of an appropriate law suggests that funding is not clearly regulated in the legislation and linked to a primary source. Nowadays, funds are obtained via multiple sources, namely municipalities, the Ministry of Health, Health Insurance Institution of Slovenia and Pension and Disability Insurance Institute of Slovenia. The proposal that was unsuccessful in 2017, predicted that the funds needed for long-term care are 480 million euros annually, however according to Buzeti in Žibret (2018) an additional 110 million euros annually would be needed for the functioning of the long-term care system in Slovenia. According to Ramovš in Žibret (2018) Slovenia currently devotes 0.9% of GDP to long-term care, where the European average is 1.3% of GDP, suggesting that regarding the number of elderly people and the number of people requiring long-term care in Slovenia that share should be closer to 1.4 or 1.5% of GDP. Due to limited funds available for long-term care in Slovenia, Bogataj, Bogataj & Drobne (2017) already proposed some methodological starting points for minimizing the cost of care. In table 4, authors present structure of personnel according to the type of long-term care providers:

Table 4: Structure of personnel according to the type of long-term care providers

| Type of provider | Percentage |
|------------------|------------|
|------------------|------------|

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|                                                                                                                                    |       |
|------------------------------------------------------------------------------------------------------------------------------------|-------|
| Retirement home and special social welfare institutions                                                                            | 48.3% |
| Family assistant and recipients of partial for lost income                                                                         | 13.6% |
| Hospitals                                                                                                                          | 11.9% |
| Protective work center and center for work, training and protection                                                                | 10.7% |
| Health center and private individuals to carry out a home-based nursing activity                                                   | 6.9%  |
| Assistance providers at home (social work centers, both public institutions, and private individuals for home-based care activity) | 5.2%  |
| Personnel for personal assistance                                                                                                  | 2.7%  |
| Household mental health providers                                                                                                  | 0.6%  |
| Institutions for children rehabilitation                                                                                           | 0.2%  |

Source: RS Institute for Social Protection (2016).

In Slovenia based on collected data and estimates (RS Institute for Social Protection, 2016) at the end of 2015 long-term care in the formal sector was carried out by 11,514 persons or 3.1 persons per every 100 65+ persons in Slovenia, which means that in comparison with 15 OECD countries, Slovenia is in the bottom half. Furthermore, the RS Institute for Social Protection (2016) estimates that approximately 70% of employees provide long-term care in institutions and 30% provide long-term care at the user's home or in various community care forms. According to the Statistical Office of Slovenia (2016) 76.5% of expenditures related to long-term care were distributed for long-term care in institutions and the other 23.5% of those expenditures were distributed for long-term care at home. RS Institute for Social Protection (2016) also reports that for every person providing long-term care, there are 5.3 persons receiving long-term care, which regarding the average of 15 OECD countries involved in RS Institute for Social Protection study (2016) means that the average workload of personnel in Slovenia is high.

#### Financial framework and existing capacities

According to the law on pension and disability insurance the allowance for support and attendance is defined as the right to compulsory pension and disability insurance, which is not dependent on the beneficiary's assets. The support and attendance allowance is a monthly cash benefit, by which the beneficiary compensates for the costs incurred due to permanent changes in the state of health, due to which he or she cannot meet basic living needs and therefore urgently and continuously needs foreign care and assistance (Pension and Disability Insurance Institute of Slovenia, 2018). In table 5 we are presenting data from the Pension and Disability Insurance Institute of Slovenia of recipients of allowance for support and attendance in the time period 2009-2018 (where data for the year 2018 are available until June):

Table 5: Recipients of allowance for support and attendance in Slovenia (2009 – 2018 June)

| Year   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Number | 29,599 | 30,092 | 30,497 | 30,731 | 30,069 | 29,840 | 30,343 | 30,852 | 31,622 | 32,281 | 32,990 |

Source: Pension and Disability Insurance Institute of Slovenia (2018).

A more in-depth examination of data available from the Pension and Disability Insurance Institute of Slovenia distributes the recipients of allowance for support and attendance into 4 categories, where for 3 categories amounts of funding are articulated and shown in table 6:

Table 6: Funding amounts for recipients of allowance for support and attendance in Slovenia (2018 June)

| Category                        | Number of recipients | Funding amount monthly (€) | Funding amount monthly sum (€) |
|---------------------------------|----------------------|----------------------------|--------------------------------|
| <b>Most severe disabilities</b> | 776                  | 418.88                     | 325,051.00                     |
| <b>Higher amount</b>            | 10,819               | 292.11                     | 3,160,338.00                   |
| <b>Lower amount</b>             | 20,706               | 146.06                     | 3,024,318.00                   |
| <b>Proportionate amount</b>     | 689                  | -                          | -                              |
| <b>Sum</b>                      | 32,990               | -                          | 6,509,707.00                   |

Source: Pension and Disability Insurance Institute of Slovenia (2018).

At the national level, for preparation of policies and distribution of financing of long-term care services it is important to obtain information about the public and private share in financing long-term care services, however in Slovenia it can be challenging to get the information as the system as a whole is quite fragmented and so is the whole financing scheme (Nagode et al, 2014). Nevertheless, according to Nagode et al. (2014), 74% of the whole expenditures for financing long-term care were public, the other 26% of whole expenditures were private, where it is important to notice that the private part of expenditures have risen more than the public part of long-term care funding (time period from 2003 to 2011). Regarding the demarcation between financing the health part and social part in long-term care, 60% of the expenditures were related to health and the other 40% to social.

Another important characteristic in long-term care is the nursing care, where the Health Insurance Institute of Slovenia (2018) divides nursing care in 3 categories in retirement homes and in general social welfare institutions. We present the categories and expenditures per day in table 7:

Table 7: Nursing care in retirement homes and general social welfare institutions in Slovenia in 2018

| Category              | Price per day (in euros) |
|-----------------------|--------------------------|
| <b>Nursing care 1</b> | 8.37                     |
| <b>Nursing care 2</b> | 12.20                    |
| <b>Nursing care 3</b> | 17.09                    |

Source: Health Insurance Institute of Slovenia (2018).

Especially in the case of retirement homes the sum provided by the Health Insurance Institute of Slovenia appears to be too low as there are estimates that due to lack of appropriate funding related to nursing care, annually retirement homes do business at a loss of approximately 14 million euros. Overall, the capacity of retirement homes in Slovenia is to provide care for 20,602 persons, however there are 7,151 applications from persons that wish to be accepted in a retirement home immediately and thus retirement homes are overwhelmed with applications.

### 13.2.6. Discussion and conclusions

The present work employed a qualitative approach, namely a case study to investigate the current state of assisted living facilities and long-term care in Slovenia. Our results indicate that long-term care services in Slovenia are in need of important improvements, as the existing system which was historically focused on funding institutionalized care services for elderly people, has proven to be ineffective and unable to satisfy all of its demand. Similarly, data and estimates show that Slovenia is in comparison with OECD or EU countries behind in providing solutions for long-term care services, therefore we propose a reorganization of existing funding system, organizational and other capabilities, in order to promote an overall better organized social system, designed for satisfying the rising and ever changing complex needs of Slovene elderly population. First and foremost it is important that the legislation regarding long-term care is regulated in terms of formally adopting the long proposed law on long-term care. Long-term care law would contribute to a more clear distinction between private and public funding that is nowadays heavily fragmented. Future studies should also focus on gaining interest from the public, especially in promoting solutions with emphasis on creating an elderly friendly

environment in communities (i.e. pavements that are completely without the possibility of ice formation in the winter) and to engage with the elderly population towards their collaboration in activating self-organized groups (i.e. 5 elderly couples that move into a bigger elderly friendly real estate complex).

Future research should be directed towards a more in-depth comparison of the current state in Slovenia with other developed countries in order to identify possible benchmarking solutions in foreign countries that could be adopted with adjustments to Slovenian local environment. Future research could also address an interesting question from the user's perspective, which is the following: how and where do the elderly want to live at an old age. One possible limitation of this paper is that it is an exploratory and inforamatory case study based on a literature review and analysis of available secondary data therefore we cannot generalize the findings. However, we can use our findings as a useful starting point in discussing future solutions regarding assisted living facilities in Slovenia.

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## 14. Sustainability

# **14.1. The Role and the importance of the Economic Impact, Institutional Legislation For Increasing Value of the Sustainability Refurbishment of the Building Stock in Kosovo.**

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APRK-MESE

## **14.1.1. Abstract:**

Abstract of this paper is based on the relevant facts which are the key factors for increase the economic range in the Building trade market and Real estate sector in Kosovo which is depend and connect with Laws and dispositions rules from the European Union in Energy sector. The paper discusses about the increasing quality of living approach in Kosovo, in accordance with Sustainable Refurbishment of Building stock. Economic value performance for this buildings ,complete the financial analyses and directly institutional Sustainability Energy Efficiency in Republic of Kosovo with European Energy legislation, were are based on the Draft proposal of Energy Strategy 2016-2026(MED - Ministry of Economic Development,2014)<sup>1</sup>.The MED is the Ministry which is responsibility for the strategic document compiled and gets form, addresses to the above ministry's in Republic of Kosovo. In this study we use actually legislation which is approved from Parliament of Kosovo since 2010 and the improved beings from 2011.

With this study we accepted to have more employments in this sector real estate, and to increase Economic sustainability in Kosovo.

**Keywords:** Economic sustainability, Legislation, Economic impact, Energy efficiency, Energy strategy 2016-2017

### 14.1.2. Introduction

Motivation-The motivation for this paper seminar No 2, is based on the facts and data's ; The European Union attaches the great importance for buildings refurbishment as part of strategy to achieve the targets for 2020 (Kyoto protocol 2020) (Kyoto protocol -2020)<sup>1</sup>, three twenty (20/20/20) 20% reduction of energy ,20% of the energy installation of RENS and the third of the 20% reduction for CO2 emissions. This targetfor the Europe are caused by the real estate sector, economic factors etc. This impacts suchas, on culture of living household,ethics, social situation all around Kosovo.The Role and the importance of the Economic Impact, Institutional Legislation For Increasing Value of the Sustainability Refurbishment of the Building Stock in Kosovo is directly depend from the economic Value to increase the employment and empowering building trade market for this area.

Study proposes- The paper discusses about the increasing quality of living approach in Kosovo, in accordance with Sustainable Refurbishment of building stock. At first, implantation of Energy Efficiency legislation in Republic of Kosovo in comparison with the European Energy Efficiency directives on Energy Building Performance (EPB) is given. This purpose is based on study cases in Kosovo with Energy sustainability refurbishment of several public and private building,sector measures taken,Economic value performance for each building,complete financial analyses and directly institutionalSustainability Energy Efficiency in Republic of Kosovo and European Energy legislation,were are based on the Draft proposal of Energy Strategy 2016-2026(MZHE - Ministry of Economic Development,2014)<sup>3</sup>,which are the strategic document form addresses to the above ministry's In Republic of Kosovo :

1. (MZHE - Ministry of Economic Development) Under this institutional body is organized and Kosovo Energy Efficiency Agency with the legislation and disposition inside the Ministry and Legislation in energy sector example :
  - Law No.04/L-016 on Energy Efficiency.
  - Law No. 05/L -052 on Thermal Energy
  - Law No. 05/L-085 on Electricity
  - Law No.05/L – 084 on Energy Regulator
2. (MTI – Ministry of Transport and Infrastructure)
3. (MEF – Ministry of Economy and Financial)
4. (MAFRD- Ministry of Agriculture and Rural development)
5. (MAPL- Ministry of Environment Urban Planning)

Under the Law on Access to Public Documents (Law no. 03 / L - 215) Ministry of Economic Development enables, media, civil society and all stakeholders have access to all required documents except the documents in which, by law there can be no access or limited access to the full documents and legislation and strategic documents in this field of area of study/.

All the legislation are based on this institutional pillars in nationwide and regarding to the secondary and primary legislation, Kosovo is in very good situation compared to the region example Albania, Montenegro, Macedonia etc. This legislation has been harmonized with the EU directives. This role of efficiency measures on the economic development of municipalities we do the analyze to compare this results given forms after the empirical calculation with applicable software assessment of different documents from the case studies of a building (residential building and business or 1-2 buildings) in Gjakova and Prishtina municipalities in Kosovo we have prepared this detail study research and from this two case studies we make the compare about that:

- Which is the important reason to invest on these buildings? Economic impact, social, environment oranother?
- Economic respondents around Kosovo areinvolved in these cases, direct impact on economic growth development and urban planning, environment etc.

For giving the good resultswe came to the conclusions about real reason for Sustainably Refurbishment of Building stock in Kosovo based on outcomes from this study, and calculation with Empirical Formulas, NPV and IRR and PBP, for each building was given that the energyefficiency is considered more and more each day as a

global economic factor, we are witnessing various and large financial institutions as well and local banks are investing in this area. The potential of investment according to the World Bank and EBRD, in this sector is about [2.5€ billion], the largest potential pertains to public buildings with 35-40%, capacity of the energy saving. Regarding financing for energy efficiency, there is an EU fund in amount of 1,5 billion Euros that could be used municipalities themselves and the organogram of this energy efficiency hierarchy can be shown in the (figure 1.2) below.

Municipality are the owners and main operators of the various public premises such as schools, medicine centers ,hospitals, municipal administration building,Court municipal buildings, kinder gardens, regional public buildings etc, this amount of building stock momentarily Audit complete projects are around (150 Public Buildings in Kosovo) prepared and they wait for EU funds and banks concessionary credits. Potential Donors from EU –and World organization are ready to invest in EE –projects and this amount, building stock in which is Auditing on this project are ready for implementing in the practice.

Efficiency fund must be established of such a fund is in contradiction to Kosovo's institutional constitution, due to the budget permission's from government and with the rules and standards In addition to the basic laws of the energy sector, since 2012 the Law on Energy Efficiency as well as a number of Administrative Instruction (AI) and various regulations including:

- Administrative Instruction for the Promotion of Energy Efficiency to End Users and energy services;
- Administrative Instruction for the Labeling of Equipment Utilizing Energy;
- Administrative Instruction on Energy Auditing;
- Technical Regulation on Energy Auditing;
- Regulation on the internal organization of the Kosovo Energy Efficiency Agency;
- Regulation on the Establishment of the Certification Commission of Auditors and Energy Managers.

Kosovo Energy Efficiency action plan (2010-2018, 2010)<sup>4</sup>, has been approved and foresees energy savings of 9% or around 92 ktOE, by 2018.

The first plan Kosovo's Mid-Term Energy Efficiency Action Plan (CEECE) 2010-2012 is already implemented and envisaged energy saving of 3% or about 31 ktOE, up to 2012 thing that is achieved.

The Second Medium-Term National Action Plan for Energy Efficiency (ECPEE)<sup>5</sup> from 2013- 2015, where savings of 3% or around 31 ktOE were anticipated by 2018.

The third plan the National Energy Efficiency Action Interim (ESPE) 2016-2018 is under way of the finalization, where the savings target is expected of 3% or about 31 ktOE until 2018.

**To date, 27 municipalities have drafted Municipal Plans for EE 2014-2020, which they also have approved them at their municipal assemblies In Kosovo.**

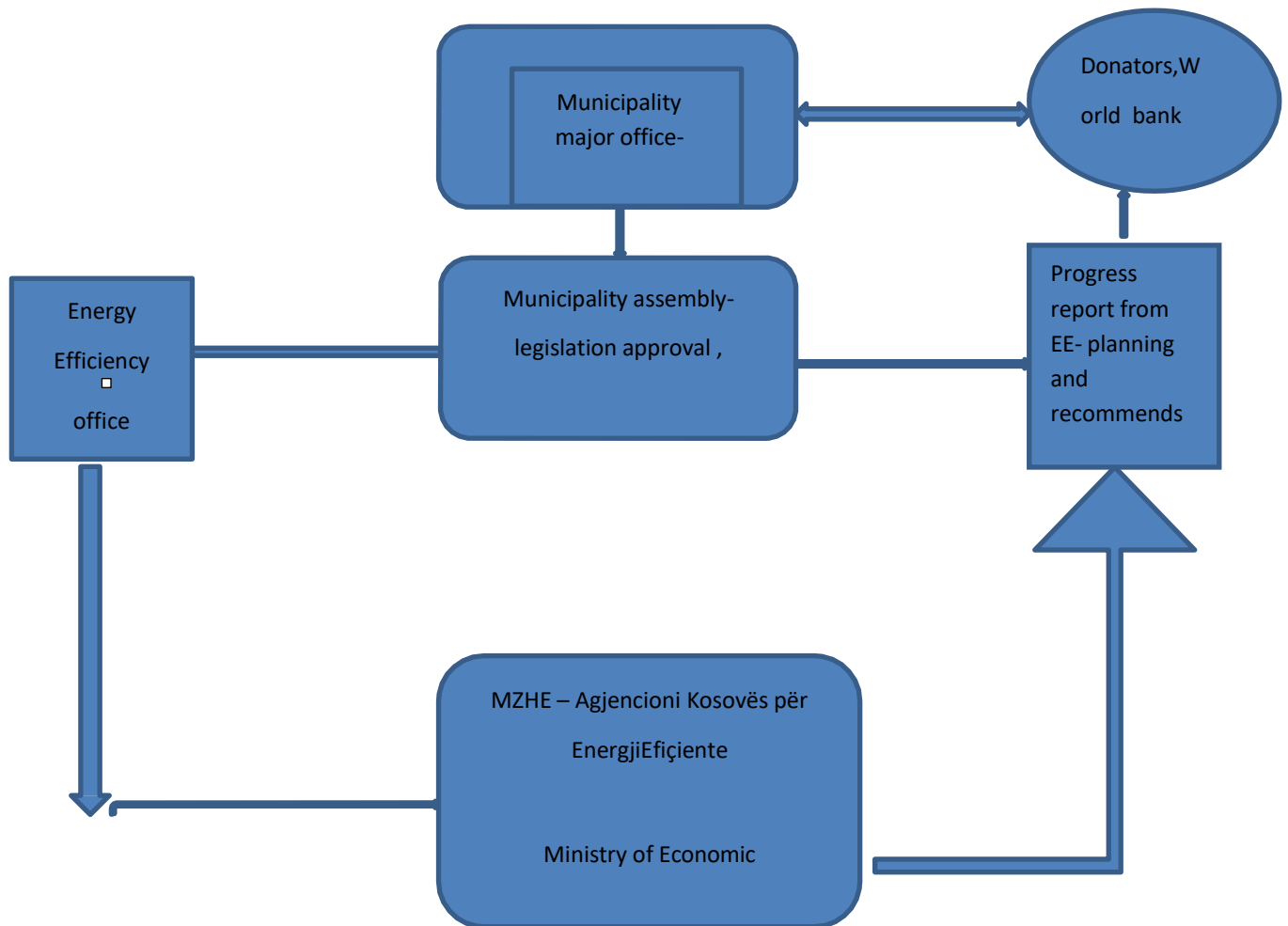
The Draft Law on Energy Performance in Buildings was approved by the Government of Republic of Kosovo while the Draft Law on Energy Efficiency is under preparation for sending to the Government of the Republic of Kosovo.

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<sup>4</sup>Kosovo's Energy Efficiency Action Plan (CEECE) 2010-2018

<sup>5</sup>The Second Medium-Term National Action Plan for Energy Efficiency (ECPEE)

*Economic development plan, for Energy Efficiency in Municipality is shown on the fig. below:*



*Fi1.1- Organ gram format for Energy Efficiency development project, for the Kosovo municipalities.*

- EU legislation: Directive 2012/27/EU of The European Parliament and of The Council of 25th October, 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. Energy Community Treaty / Kosovo.

Directive 2004/EG, 2006/EG and the latest directive 2012/27/EU and Kosovo's Obligations to the European Union (EU) are based on the reality, South –Eastern Europe, including Kosovo, through establishment of Energy Community<sup>3</sup> (ec.europa.eu. Energy community /European Parliament and the Council, 12.06.2014)<sup>3</sup> is required to full fill the European Directives, Which put the large challenges in the front of the energy market.



Figure 1.2 Energy building performance EPB-identified by color

Nature of purpose is to achieve the goals with this work in the practical applications for building performance (EPB) on the study cases where we found the:

- Level of economic impact, where we used the software applicable for this study's as all formulas' and inspection material from facilitate on the building where we find the energy expenses from last(3 year) for each building facilitating.
- Energy and another costs analyzes, and PBP and NPV .data compares before and after refurbishment.
- Economic indicators who are directly involved in the public building sector ,especially in the Energy Efficiency level of building construction.

KEY ECONOMIC INDICATORS: In Kosovo year 2016 /2017 GDP (mil) (Q1)1,252 5,984

GDP per capital (mil.) **3,513\*3,339CPI** (%) .(August) [1.7%- 0.3%.]

-Remittances million €. (June) 2017, [360.- 691mil euro]

GDP Real Growth Rate (TM1)**3.9\*3.4%.**, and the target for 2018 is **4.4 real GDP growth in Kosovo.**

-Foreign Direct Investment in Kosovo (million € )(June)/2017 –[ **139.2million €**]

-215.9Import (mil.) (July)**1,671.62789.4.** Public Debt (% GDP) (TM1) **15.02% -14.47%**

Export (mil.) [309.6 (July/2017) -**217.6.**]

All this data was given from theMDE (Ministry of Economic Development) and from Kosovo Agency of Statistic (KAS)./page-4,8

#### 14.1.3. Methodology and proposal hypothesis

**Using methodology** for this case study's: as we describe in the introduction and proposal hypotheses are in accordance with this empirical work with solving the NPV, IRR and EPB using the formula with the data in applicable software were is finding the real economic Impact or Economical reason: FOR THE INCREASING THE VALUE OF THE SUSTAINABILITY REFURBISHMENT OF THE BUILDING STOCK IN KOSOVO.

Proposal Hypothesis: Calculation form on excel sheet and data are used in one or two example for this study when used formula forms calculation with empirical and equivalent factors.

- 3 First example: **Hotel President, Commercial private Building – Gjakova municipality. Building total [Area 4355 m2].**



**Methodology used:**

- This case study is used for auditing process were after the inspection we find a lot of problems for energy savings and the implementation of the Energy Performance of Building (EPB) can be improved using the terms and standard criteria based on the law for Energy Efficiency and other relevant disposition with Kosovo legislation.
- Calculation and data from excel sheet are part at this paper study results
- Also and scheme and layout are the part of study example

This building has been facilitating on energy consumption and energy demands during my study in 2014-2015, for loan request with EBRD and World Bank in Kosovo. With one detail inspection and calculation on energy systems inside this hotel (buildings) we came to the conclusions, economic and financial situation during the measures for implementation.

All the data and calculation can be a part of this study.



*Photo 2- Frontal view of Hotel President -before the Auditing process*

### **2.1/MEE – Measures for Energy Efficiency in this building**

Description of the building and data collection on energy:

The Hotel-President's facility was built during the years 2004-2013, located in the entrance area of the city in the northeastern part of the road (Gjakova - Kline – Prishtina) ridge and is exposed to air currents from the north and south.

The data collection on energy is done after interviewing the management and technical staff and the detailed visit to the facility.

#### Management Information

The audited building process general description:

Audit Date ; [12.02.2014- 15.02.2014], Written inspection main data are described below.

The person interviewed Object Hotel President –Gjakova [Shpresa Hana, director owner, tel: 044 221 597]

Year of building final construction 2006.

Type of building : Status[Private Property Hotelier restaurants] Type of structure : Massive and skeletal system.

Number of complete floors 3 (basement, ground floor, 2nd floor + intersection) Annex does not exist.

The general situation of building:

Technically- sanitaryrelatively good situation. Management:

Working day 365

Working hours 16 hours - in the summer season the working hours can be extended for 3 hours.

Number of users Depending on the season (summer 300-500 guests) or the winter depends on the organization or Wedding events, party etc.

Staffing number [22 +3 = 25]

Responsible for Maintenance The building has a maintainer (homeowner) who is responsible for the maintenance of energy installations and the entire technical system Recent renovations regarding EE:

Type (new buildings and refurbishments) 2012/2013 Large halls on the floor, Partition part and Roof with panel insulation panel .year [2010/2011/2012]

The hotel facility is managed by the hotel manager (owner) who assigns the personnel for the operation, supervision and maintenance of all the energy equipment's. Also regarding the technical data we have the information from the audit process presented with sheet data.

General data on the building are given;

The main geometric data for the Hotel President - building

No.( b + p + 2 + Unfloor) size Floor height Windows Exterior doors Exterior walls. Floor area **(4355m<sup>2</sup>)**.Floor volume Remarks.**[19438.49] m<sup>3</sup>**

(M ') (m') (m<sup>2</sup>) (m<sup>3</sup>, depend of total 19438.49 m<sup>3</sup> highest of hall and rooms interior.

#### **14.1.4. Auditing process and methodology used**

**Executive summarize at the deep auditing process:**

- 3.1.1 Laws
- 3.1.2 Administrative Instructions
- 2.1.3 Regulations
- 2.1.4 European and International Regulations and Standards

### **3.1 Energy Management and Energy Auditing in Buildings**

- 3.2 Energy and thermal installations of the building which are controlled during the audit
- 3.3 Benefits from Energy Auditing process
- 3.4 Financial Benefits
- 3.5 Operational benefits
- 3.5.1 Environmental Benefits:
- 3.5.2 Building Description and Data Collection on Energy

### **4.0 Detailed calculations for thermal efficiency of hot water production**

- 4.1 Detailed description of the heating system
  - 4.1.1 Boilers
  - 4.1.2 Flammability
  - 4.1.3 Fuel-fuel, gas oil or diesel
- 4.2 Estimated Efficiency Based on Measurement and Calculation
  - 4.2.1 Analysis of combustion gases
  - 4.2.2 Calculation of heat
- 4.3 Final Basic Scenario Acquired for Efficiency Computation
- 4.4 Measuring instruments used during the audit

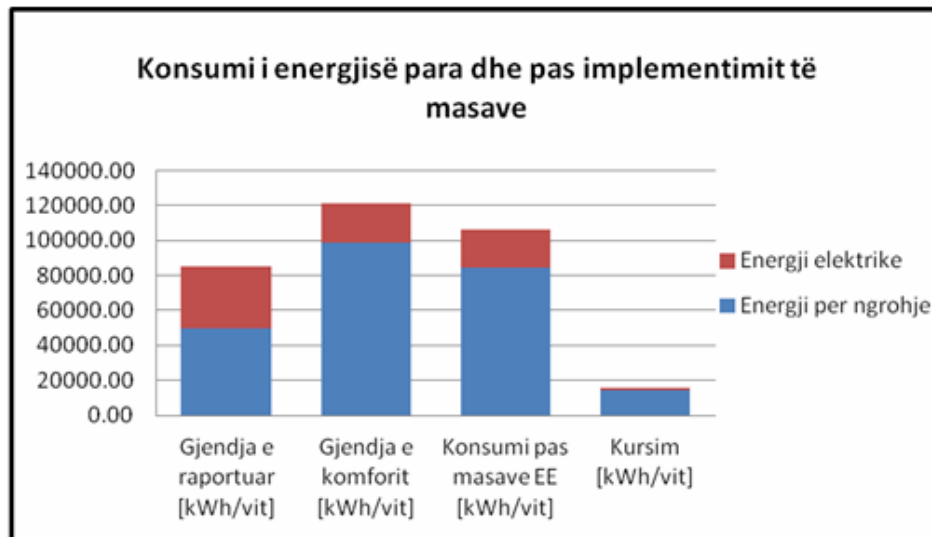
### **5.0 Detailed calculations and thermal efficiency for the basic scenario (without EE measures) and after the implementation of EE measures**

- 5.1 Heating charge
- 5.2 Ventilation load
- 5.3 Charging charge
- 5.4 Lighting charge

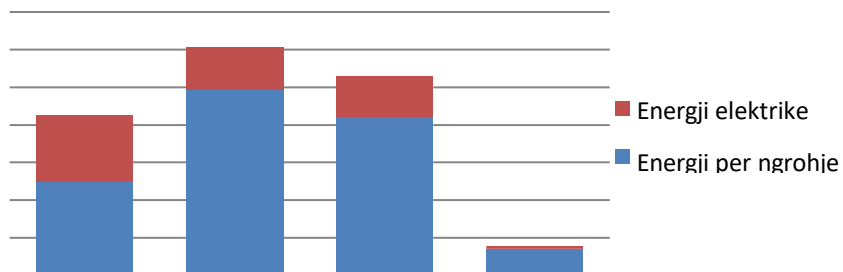
5.5 Charge for the preparation of sanitary hot water

5.6 Charges for other electrical equipment

5.7 Comparison of total current consumption with energy consumption before / after the implementation of EE measures under the conditions of meeting the comfort standard.



6.1 Calculation of energysavings before and after measures



|                                              | Consumption<br>standardized condition<br>for comfort [kWh /<br>m <sup>2</sup> /year] before | Consumption<br>after Energy<br>Efficiency<br>measures comfort<br>[kWh/year ] | Savings [kWh/year] |
|----------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------|
|                                              | 340,326.85                                                                                  | 187,200.94                                                                   | 153,125.91         |
| Energji elektrike                            | 108,651                                                                                     | 65126                                                                        | 43525              |
| Total Energy savings                         | 448,977                                                                                     | 252,326.94                                                                   | 196,650.91         |
| konsumi specifik [kWh/year /m <sup>2</sup> ] |                                                                                             |                                                                              |                    |
| $A=4335[m^2]$ for total Building area        | 199.45                                                                                      | 112                                                                          | 87.36              |

Table 6.01. Comparison of calculated and post-EE measures for all energy consumers expressed

in specific consumption [kWh / year / m<sup>2</sup>] we reduce up **to the savings energy total consumption 87.36**  
[kwh/m<sup>2</sup>] x 0.7€ cent = 61.52 € x 360 = 22014€ savings /year

6.2 Proposed EE measures for reducing the heat load.

6.3 Proposed EE measures for reducing the load of ventilation

6.4 Proposed EE measures for cooling load reduction

6.5 Proposed EE measures to reduce the load for illumination

6.6 Proposed EE measures for reducing the load for the preparation of sanitary hot water

6.7 Proposed EE measures for Reduction of Load from Other Electrical Equipment

6.8 Calculation of total energy savings for all energy efficiency measures

## 7.0 Reduction of greenhouse gases and acid rain gases

7.1 Total reduction of greenhouse gases and acid rain gases after the implementation of efficient energy measures

8.1 Define the investment for which measure of EE

8.2 Define the investments for which energy efficiency measure presented by the energy demand for reduction of heat load, HVAC, lighting, sanitary water and other electrical equipment

9.0 Economic and financial analysis of EE measures

9.1 Financial and Economic Indicators (NPV, IRR, PBP) for all EE measures

9.2 Current price and future projected price for fuels and fuels

## 10.0 Investment Plan and Conclusions

10.1 Recommended measures for low cost saving and no financial cost

10.2 High-cost Recommendations for Increasing Energy Efficiency

10.3 Total recommended investments for increasing energy efficiency

## 10.4 Conclusions and Final Recommendations

### 10.5 List of EE equipment and proposed financial measurescost benefits

The present study include the all auditing process with EE standards, but based on our paper seminar work , we are focused in the point 3[3.1,3.2,3.3,3.4 and 3.5] more on point(9.0, 9.1) and **finally on point 10.0** Investment plan and final economic recommendation and proposed financial measures which are directly depend from the economic Value for increasing the employment and building trade market in this field possibility to increase the standard of living with the sustainability refurbishment of the building stock.

For this seminar paper must be the main hypothesis for solving the problem after the auditing process and technical measuresused , as we use the paragraph numbers:

#### Analyzing methodology : Economic and financial analysis of EE measures

For the financial and economic analysis the project prices have been obtained for which fuel from the Energy Regulatory Office and the fuel price trend has been taken for the next 25 years presented in the table below:

| Financial trends  | 2012 -2020 | 2021 -2035 |
|-------------------|------------|------------|
| Electrical energy | 3%         | 5%         |
| Diesel            | 3%         | 5%         |

Table 9.01 Financial trends in % , fuels trends growth

| Economic trends   | 2012 | 2013 | 2014 | 2015-2020 | 2020-2035 |
|-------------------|------|------|------|-----------|-----------|
| Electrical energy | 8%   | 7%   | 6%   | 5%        | 5%        |
| Diesel fuel       | 3%   | 3%   | 3%   | 3%        | 5%        |

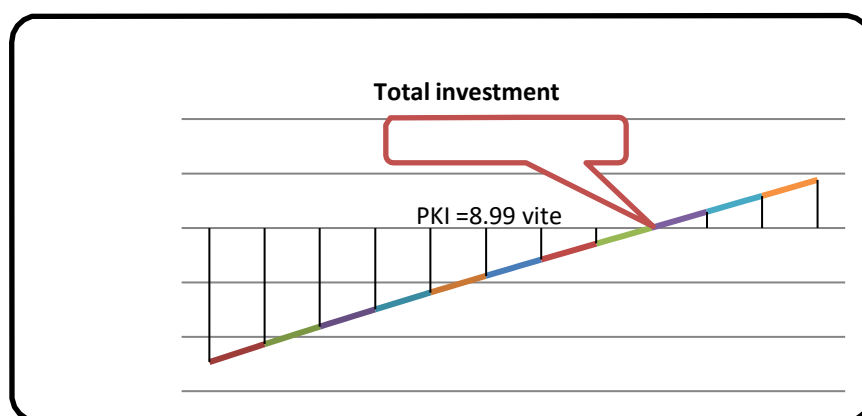
Table 9.02, Economical trends

### 9.1 Financial and Economic Indicators (NPV, IRR, PBP) for all EE measures

The table below shows the impact of EE measures on an object based on financial indicators (NPV, IRR and GDP)

| No | Energy efficiency measures description | Savings [kWh] | Savings [EUR] | Investment [EUR] | NPV [EUR] | IRR [%] | PBP [vite] |
|----|----------------------------------------|---------------|---------------|------------------|-----------|---------|------------|
| 1  | Building envelope                      | 86593         | 1294.34       | 165834           | 12,758.01 | 15.9%   | 8.16       |
|    |                                        | 153,125.91    |               |                  |           |         |            |
| 3  | Elektricity power system               | 43525         | 146.97        | 2175             | 341.06    | 6.5%    | 7.21       |
|    | Gjithsej                               | 196,650.91    | 1764.90       | 14010            | 16,146.41 | 14.5%   | 8.99       |

Table 9.1.1 – Efficiency measures with financial indicators



9.1.2 Payback period (PBP), 8.999 year .

Based on the financial ranking of fuel prices raised by ERO, it can be seen that if today the total electricity price including VAT is 0.11 [Euro / kWh] in 2035 this price will be 0.2984 [Euro / kWh], while the price of [kWh] produced by oil which today is 0.1107 [Euro / kWh] in 2035 will be 0.2916 [Euro / kWh].

| Economic trend prices       | 2012   | 2013 | 2014 | 2015-2020 | 2020-2035 |
|-----------------------------|--------|------|------|-----------|-----------|
| Electricity [%]             | 8%     | 7%   | 6%   | 5%        | 5%        |
| Electricity price [EUR/kWh] | 0.11   | =    | =    | =         | 0.3754    |
| Petroleum diesel [%]        | 3%     | 3%   | 3%   | 3%        | 5%        |
| Petroleum [EUR/kWh]         | 0.1107 | =    | =    | =         | 0.2916    |

TABLE 9.2.2 Economic trend of Price render for Electricity and Petroleum

## 10.0 Investment Plan and Conclusions

### 10.2 High-cost, medium-cost recommendations to increase energy efficiency

- Replacement of windows and doors
- Clearing the existing network
- Replacement of Fluorescent Lamp HE T5 2x28 [W]

### 10.3 Total investments recommended for increasing energy efficiency

|   | EE proposal mesures recomandation |                     |
|---|-----------------------------------|---------------------|
| 1 | Building envelope                 | 110860              |
| 2 | Thermal system                    | 81200               |
| 3 | Electricity system                | 36000               |
| 4 | Ventilation and comfort HVAC      | 11610               |
| 5 | Solar collector system            | 12400               |
|   | <b>Total investment</b>           | <b>219,670.00 €</b> |

### 14.1.5. Conclusions and final recommendations

The President Hotel building is a new facility built in 2006-2012 which is relatively good in terms of energy efficiency. There is no internal comfort in the building both in terms of heating and ventilation.

**Note important :**

In the existing state the building represents a consumer of 199.45 [kWh / m<sup>2</sup> / year]. After taking EE measures, the specific consumption decreases to 112 [kWh / m<sup>2</sup> / year].

The audit findings in this building indicate that with an investment of 219,670.00 Euro, the return period of the investment is 9 years, which makes this investment attractive and worthwhile to invest.

**14.1.6. General conclusions:**

The Role and the importance of the Economic Impact, Institutional Legislation For Increasing Value for the Sustainability Refurbishment of the Building Stock in Kosovo, is the reality and it's one of the good reason to invest in this sector, because of increasing financial investments the real estate in Kosovo can have the stability ratio. The Trade market and Employment in the building sector has to be increased, based on real and financial calculation from the study cases in Kosovo Building sector. So the positive role is on the Economic and GDP growth in Total the main Issue. of this study research.



**Building view Hotel President after the financial investment from 2016**

Note: The amount of financial investment was done from EBRD –bank in Kosovo and the part of investment are from the business partners.



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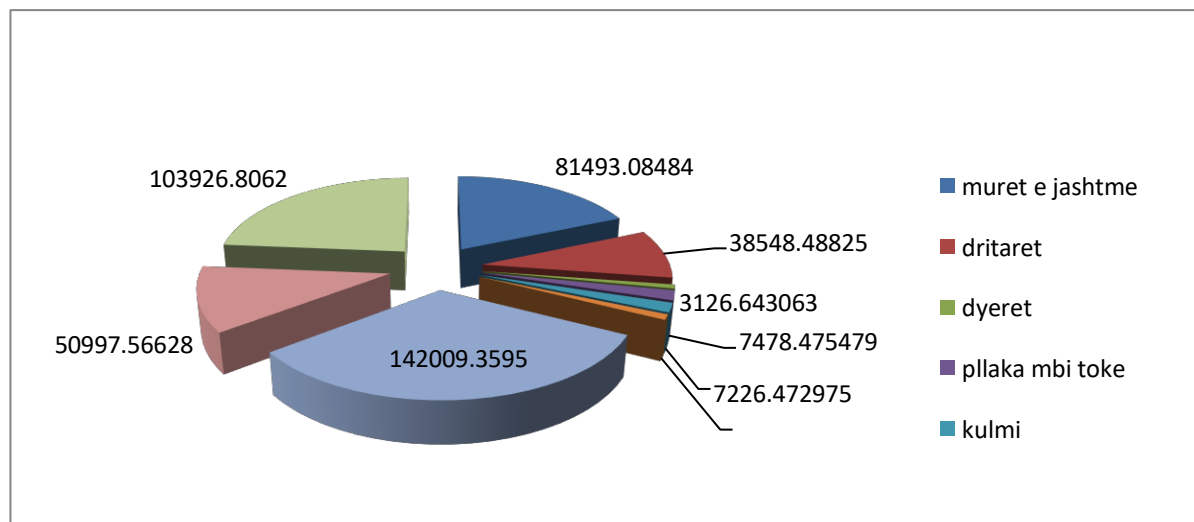
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Data collection from HOTEL PRESIDENT

| Të dhënat kryesore gjeometrike për ndërtesën HOTEL Presidenti -Gjakovë |               |                    |                  |          |                 |                      |                         |                |         |
|------------------------------------------------------------------------|---------------|--------------------|------------------|----------|-----------------|----------------------|-------------------------|----------------|---------|
|                                                                        |               | Perimetria e katit | Lartësia e katit | Dritaret | Dyert e jashtme | Muret e jashtme (m2) | Sipërfaqja e katit (m2) | Volumi i katit | Vërtetë |
|                                                                        |               | (m')               | (m')             | (m2)     | (m2)            |                      |                         | (m3)           |         |
| 1                                                                      | Bodrumi-nen   | 117                | 4.4              | 24.43    | 15.24           | 443.72               | 743                     | 3269.2         |         |
|                                                                        |               | 178                | 4.4              | 116.72   | 9.68            | 423.32               | 798.93                  | 3515.292       |         |
|                                                                        |               | 179                | 3.6              | 103      | 8.6             | 776                  | 984                     | 4329.6         |         |
|                                                                        | Kati 1- banim |                    |                  |          |                 |                      |                         |                |         |
| 4                                                                      | KATI2         | 179                | 6.6              | 28.32    | 5.6             | 947                  | 910                     | 6006           |         |
| 5                                                                      | nderkulmi     | 125.84             | 2.52             | 19.6     | 2.2             | 193.2                | 920                     | 2318.4         |         |
| Totali                                                                 |               |                    | 292.07           | 41.32    | 2783.2          | 4355.93              | 19438.492               |                |         |

## Excel calculation , Hotel President –Gjakova , Kosovo

tabela 5.7.2-Krahasimi i shpenzimeve per energji per ngrohje

pra masave te EE dhe pas saje total dhe perqindje

| Elementet e Strukturës | Sipërfaqja | Humbjet e Energjisë para masave EE |                             | Humbjet e Energjisë pas masave EE |                     | Kursimet e energjise |
|------------------------|------------|------------------------------------|-----------------------------|-----------------------------------|---------------------|----------------------|
|                        |            | U vlera                            | Humbjet e Energjisë termike | U vlera e re                      | Humbjet e energjise |                      |
|                        | m2         | [W/m2K]                            | [kWh]                       | [W/m2K]                           | [kWh]               | [kWh]                |
| Muri i Jashtëm         | 2783       | 1.718                              | 107,181.12                  | 0.33                              | 20,587.76           | 86,593.36            |
| Dritaret               | 292        | 2.8                                | 18,328.33                   | 2.8                               | 18,328.33           | -                    |
| Dyert                  | 41.32      | 2.8                                | 2,593.58                    | 2.8                               | 2,593.58            | -                    |
| Dysheme mbi toke       | 743        | 1.773                              | 4,402.76                    | 0.54                              | 4,402.76            | -                    |
| Tavani                 | 910        | 1.986                              | 40,958.97                   | 0.373                             | 7,692.70            | 33,266.27            |
| Kulmi                  | 920        | 0.801                              | 40,958.97                   | 0.373                             | 7,692.70            | 33,266.27            |
| Izolimet ne gypa       |            |                                    | -                           |                                   |                     |                      |
| humbjet ne transmetim  |            |                                    | 214,423.73                  |                                   | 61,297.83           | 153,125.91           |
| Infiltrimet            |            |                                    | 125,903.11                  |                                   | 125,903.11          |                      |
| efiqienca e kald.      |            |                                    |                             |                                   |                     |                      |
| totali                 |            |                                    | 340,326.85                  |                                   | 187,200.94          | 153,125.91           |
| totali ne perqindje    |            |                                    | 100%                        |                                   | 45%                 | 55%                  |

## **14.2. Social indicators for sustainable communities**

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### **14.2.1. Abstract**

**Purpose:** Social indicators for sustainable communities are important to identify suitable strategies for developing an area and to reflect on progress. However, within the urban environment there is an emphasis on indicators at the planning stage, which is not emphasized when a district is fully developed or regenerated and in use. There is a disconnection between local level of needs and strategic level plans which runs counter to the holistic approaches promoted within a sustainability rhetoric. In this paper, we discuss the scope of an FM approach to include indicators on services and continuous monitoring of indicators in use to ensure longterm sustainability of a neighborhood.

**Design/methodology/approach:** The paper review studies from facilities management and urban design to argue for linkages to be made between these two disciplinary areas for the development of social indicators for sustainable communities.

**Findings:** The argument is that in order to ensure sustainability of cities, early FM thinking needs at planning/design stage should be done to alleviate the challenges of linking local needs to strategic municipal decisions. In addition, the implementation of indicators to assess how decision are impacting local areas and the sustainability of city targets should be developed as new developments are realised and operationalised. The use of these indicators in a continuous monitoring of the areas will facilitate in ensuring sustainable goals of a district remain on target.

**Research limitations/implications:** The research builds on previous studies on the urbanisation of FM but is limited as further research is necessary on the development of specific indicators.

**Originality/value:** The value is to see the benefits of social indicators to raise the awareness of the sustainability in the area and to activate the positive people behavior.

**Keywords:** Sustainability, Urban area, Facilities management, Community participation.

### 14.2.2. Introduction

Cities are estimated to produce as much as 78% of greenhouse gas (GHG) and the urban population is expected to expand so that 60% living in cities by 2030 (<https://unhabitat.org/urban-themes/climate-change/>). While this is problematic, it is also possible to view cities as potential solution drivers of transformative action through sectoral, demographic, spatial and ecological aspects against climate change (Hughes, Chu and Mason, 2018). Indeed international agreements and directives to tackle climate change underline this perspective, specifically the Paris Agreement (2015), UNFCC and Sustainable Development Goals. The Brundtland Report underlined the three major priorities for sustainability within the triple bottom line – social, economy and environment. In a recent article, Folke (2016) embeds the triple bottom line in terms of a sustainable biosphere viewing the social and economic as intertwined and co-evolving shaping each other. As can be seen in Figure 1, he puts the environment as an externality to the biosphere and a precondition for social justice and economic development. However, throughout this sustainable biosphere the global goals are linked with the goal of partnership being central.



Figure 1 Carl Folke et al, 2016

The social aspects underpinning sustainability illustrates the importance for dialogue and cooperation to meet the sustainable goals. Partnerships play a key role and are particularly important when considering the scale of neighborhood within cities. Neighborhoods are made up by different partnerships, which include residents, commercial industry and political/municipality representatives. Indeed a neighborhood should ideally incorporate the triple bottom line of sustainability being social, economic and environment as well as their inter-relationship. The challenge of understanding the role of social aspects within the complex environment of the city lays in their intangibility and subjective needs of communities living in different areas of the city. Studies reflect these challenges and particularly in terms of developing sustainable indicators for planning purposes of a district (e.g. Turcu, 2013 and Read et al., 2006). However, there is little consideration on the strategic and operational maintenance aspects of cities and there is much more focus on the early stages of planning and design to reduce carbon emissions. There is a clear gap in ensuring sustainability of cities if the focus remain on the planning and design stages and not on the operational stages of developed districts. This is particularly apparent when examining the figures of buildings as energy consumers. For example, buildings in the UK use almost 45% of generated energy for power and maintenance compared to the lower value of 5% used in the construction phase

of building (CIOB, 2004). In Norway, 40% of the energy use goes to the operation of buildings and therefore, the reduction of energy consumption of buildings will have a big impact on the total energy consumption of the country (Strand, 2011).

In addition, studies have shown the clear relationship and influence people have on energy use of buildings (e.g. Pettersen et al., 2007). While the technical mechanisms of how sustainable a building can be are decided in the planning and design stages, the lack of consideration on how to maintain buildings does impact the level of sustainability that can be achieved. When one multiplies this impact of poorly maintained buildings by a neighborhood or city-scale, the impact on achieving city targets to reduce carbon emissions could potentially be detrimental. A life-cycle perspective for sustainability means not just focus on how to reduce carbon emission which is possible at the planning and design stages, but also on how to continuously reduce carbon emissions on buildings within neighborhoods and cities are in operational stages.

Buildings are a major part of cities and people are active participants of behaving in sustainable ways therefore both building and people are necessary to work with to reduce carbon emissions. Facilities managers play a key role in commercial buildings, as one of their key objectives is to maintain and operate a building, in other words ensure buildings are resilient and sustainable while also meeting the core needs of those who use them. Taking facilities management thinking on a broader city scale will further increase sustainability of cities by ensuring they continue to meet the needs of citizens and in making cities more resilient. Social indicators play a key role in identifying citizen (residential and commercial) requirements of the city on the operational level and the municipal plans on the strategic level. Indeed sustainability is a social construction and how people understand it influences their behavior. This paper examines the idea of the use of social indicators through integration of top-down and bottom up approaches within facilities management thinking. Specific research questions consider why connect facilities management to the urban environment and how indicators can facilitate in this connection. The paper draws on urban planning literature and facilities management literature to connect how both disciplines are required in the development of indicators for long-term sustainability of cities. The paper first discusses the method engaged to develop the literature review of the topic and the rest of the paper is structured to focus on key points in developing arguments for linking FM to urban design through indicators. Specifically the subject headings are – cities within a facilities management perspective; indicator tools in social arenas of neighborhoods and a discussion of social indicators which incorporate FM perspective. We conclude with key argument in the development of an FM perspective within an urban scale.

#### **14.2.3. Method**

The paper is led by the research questions on why connect facilities management to the urban environment and how indicators can facilitate this connection. The paper development was therefore initiated by a review of recent literature based within urban design on participatory approaches and indicators derived from such approaches. A development of the understanding of the FM perspective was conducted by examining literature based on urbanizing FM and general techniques used within FM. As this area is in a mode of development and required an examination from two different disciplines – urban design and FM, a systematic review insufficient to respond to the questions. Instead, authors conducted reference searching of relevant papers in a sort of snowballing fashion where one paper would lead to finding several other relevant paper.

#### **14.2.4. Cities within a facilities management perspective**

Cities reflect a complexity of a “co-evolutionary and non-linear nature of change which incorporates a range of actors and networks operating over long time-scales” (Dixon, Eames et al. 2014). The context of cities and the multiple dimensional aspects of sustainability necessarily means that the a cross disciplinary approach is necessary in order to account for organizational and structural conditions as well as the broad range of stakeholders with vested interests (Schweber and Leiringer, 2012). The sustainability of the physical environment in existing neighborhoods is important as buildings account for the main source of energy use in Europe (Directive 2010/31/EU). In addition, the majority of the European building stock that will exist in 2050 has already been built (Buildings Performance Institute Europe BPIE, 2011), most of which suffers from poor energy performance (Meijet et.al, 2010). The planning of the regeneration of a neighbourhood in a city environment is not just about

the specific location of that space. It is also about the connectivity to its wider environment and this is often lacking in the planning of city and built environment dimensions (Dixon, Eames et al. 2014). There are shortsighted hierarchical agendas which prohibit the incorporation of renewables in urban planning which can be described as inherent temporal (not in my term), spatial (not in my patch) and institutional (not my business) scales (Dixon, Eames et al. 2014). The governance of planning decisions may be influenced by the political agendas of those in power. Little is known how integrated local community values and understandings of sustainability is integrated into plans (Turcu, 2013) where final decision is with politicians. There is often a danger that local needs get lost in the noise of the different agendas involved in planning.

Urban FM is not a new concept and was originally explicitly used by Roberts in 2004. Roberts (2004) referred to Urban FM as an extension to in community facilities and systems in order to provide a platform for agencies and the private sector in new and innovative settings for the benefit of the community. The focus was to put people first. Such an idea fits the definition of FM based on the European FM standard into an urban context. This standard defines FM as “the integration of processes within an organisation to maintain and develop the agreed services, which support and improve the effectiveness of its primary activities” (EN 15221-1, 2006). With the organization represented as the community and the role of FM being to support all services to benefit the community.

The alignment of FM with community facilities is underlined where the increasing costs of operating facilities and associated services has resulted in a need to seek solutions for better management of facilities (Mohd et al., 2013). Solutions include social enterprise for social and/or environmental improvement (Mohd et al., 2013); the regeneration of communities through strategic considerations of place design and corporate social responsibility within FM (Larsen et al., 2011); Community-based FM (CbFM) which focuses on the long-term presence of built assets in a community (Alexander and Brown, 2006). These studies present clear arguments of the benefit of extending facilities management from individual organizations and buildings to local economies and communities. One of the underlying rationales to urbanise facilities management is that “cities increasingly act like corporations in their strategic planning at the same time as the theme of urban quality is playing a larger role in such a way that corporations have become urbanized” and the need to consider “the life between the buildings” (Larsen et al., 2011:81). Alexander and Brown (2006:255) state three key areas of how FM can develop corporate social responsibility within communities:

- ensuring that the physical environment does not deteriorate
- creating a platform for skilled employment opportunities
- the opportunity for genuine involvement of the communities in the design and management of services and the urban environment

When considering the facilities management perspective of sustainability in cities, it is possible to consider the idea of adaptability. Often scenarios developed within the planning process to design is for future citizens of an area, but in reality it is not always possible to account for all variables, as the future is always uncertain. In general, a building's life-span lasts approximately 40 years and it is possible that it will have to adapt to the needs and interests of different actors in this period (Geraedts et al., 2017). The idea of adaptability comes under a building's ability to meet changing demands from users without physical changes (Geraedts et al., 2017). Facility managers as the custodians of buildings are in a prime position to ensure building can be adapted to meet owners and user's needs as well as societal requirements. There have already been efforts to develop indicators within this context (e.g. Geraedts et al., 2017). Within the concept of sustainable FM, it is key for managers to be proactive in reducing energy consumption and preserving the environment (Elmualim, 2016). However, companies give FM the remit to maintain and operate building, which is not the case in cities. This approach appears much more divided amongst city departments responsible for waste etc. The goals set at the strategic level within municipal goals and political agendas seem diluted amongst the operational departmental responsibility for the city's operation and maintenance.



The challenges of linking strategic goals at the city level to operations at the local and district level is made clear within the planning literature. The tactical measurements of assessing whether a service is good or bad as done on the individual building level become much more complex at the city level. There are many diverse areas within a city as neighborhoods are made up of different people who assign different degrees of importance to an area and it is unclear how these local agendas become integrated at the policy level (Turcu, 2013). In this way, there is no clear connection between the strategic level of political and municipal goals and local operational level of the people working and living in the neighborhood. The social construction of sustainability in cities is district dependent on the cultural values and priorities of that district.

However it is problematic as *“many indicator sets do not rest on citizen’s values and understanding of sustainability, but rather on expert views on what these values might be”* (Turcu, 2013, p.702). This top down approach to developing areas where users views are excluded may mean that cities sustainable agenda is not meeting the goals as expected.

There are various studies within the building context where the exclusion of users from the rationality of sustainable technical implementation result in unintended consequences that may run counter to the sustainable goals. One example is where users manipulate the sustainable aspects for their own comfort needs (Petersen et al., 2017). Increasing the exclusion of users on a city scale indicates that such an affect can result in a counter effect on sustainable goals. On the other hand, districts acting individually will also be detrimental to sustainable goals as sustainable success calls for holistic approaches and partnerships. In this way, the inclusion of the top down approach within the district level is important. As Turcu (2013, pp.711) states *“...a community goal may not always be to reach a defined (policy) target/indicator, but to respond to local condition(s) which impact or influence that certain target/indicator”*. Cities can become “sustainable heroes” by focusing on sustainable integration from both top down and bottom up approaches, accounting for both the strategic and operational outlooks of the city. The use of social indicators offer an opportunity to tie the immediate local needs of a city with the wider strategic sustainable targets of the city.

#### **14.2.5. Indicator tools in social arenas of neighborhood space**

Often the use of indicators provide ‘technocratic policy-making’ where the policy process is linear and indicators inform on that process through measurability, validity and transparency (Holman, 2009). However, such an approach neglects uncertainty in terms that cities have a non-linear nature of change and any change is for a long-term period. Urban decision-makers are often constrained with short time-scales and the immediate spatial scale of their jurisdictions with ‘nested’ governmental hierarchies (Dixon, Eames et al. 2014). In reality, a broad network of actors drives change from both inside and outside government (Holman, 2009). Indicators can play a role in “network integration between policy makers, department, and stakeholders across spatial scales and policy sectors” (Holman, 2009:370). Policy makers need to be part of the discussion in the development of neighborhoods. However, views from policymakers should incorporate the wider network of actors who are within the neighborhood and those who are external to it. Social indicators play a crucial aspect of this integration. There has been some efforts in linking the social to sustainability as illustrated in the following sections.

#### **BREEAM Communities and BREEAM in Use**

Prescriptive tools such as the Building Research Establishment Environmental Assessment Method (BREEAM) become more and more used within an international context (Cole and Valdebenito, 2013, Kallaos and Bohne, 2013). One of the best-known ways of assessing sustainability approaches for communities in the built environment is BREEAM Communities and BREEAM in Use. BREEAM In-Use international standard for commercial buildings enables owners to track the performance of their assets, supporting operational efficiency and sustainability (BREEAM, 2016). BREEAM Communities is a variant of BREEAM and assesses social, environmental and economic sustainability of large-scale developments; such developments impact the infrastructure and local services. BREEAM Communities promotes cooperation among stakeholders through a common framework in which there is space for changes and improvements whenever they are necessary during the planning process (BREEAM, 2013). The section under BREEAM Communities on Community Management of

Facilities aims to support community's active involvement in developing, managing and/or owning selected facilities. The assessment criteria of up to three criteria includes

- development and management of community facilities in construction phases with procedures in place for handover as well as training and user manual for party responsible for operation and maintenance (one credit);
- developer provide significant support to a community group to implement one or more community facilities (two credits);
- developer supports a Community Development Trust (CDT) and management structures are agreed with the local authority (three credits).

This approach neglects the method on how to get a community prepared to implement BREEAM and does not set up an approach to monitor progress but examines criteria through document based evidence – in this way it is more reflective than intuitive.

The detail of BREEAM in Use and BREEAM Communities is limited by criteria approaches as it more a process of 'tick the box' thus not taking into account the different contexts in which it is applied to and excludes real engagement of stakeholders. Rather engagement of stakeholder aims to fit the criteria than having criteria tailored to their needs. The prescriptive process of BREEAM removes clear assessment of decisions made for a community, but an indicator process could facilitate a broader assessment through a continuous monitoring.

#### **Smart Cities Information Systems (SCIS)**

The Smart Cities Information Systems social monitoring guide promotes engagement during the phases of developing energy efficient building projects where indicators are based on a broad framework of satisfaction and comfort of residents after completion of building works (Ferrer, 2016). Three stages of social monitoring are recommended – Stage 1 before the project starts, stage 2 during the project and stage 3 after completion. While the interaction of wider stakeholder groups (including enduser) is valuable to ensure design meets user needs, the process does end after completion. However, research of buildings require a settling in period before users can really understand how the design of the building meets their user needs and sometimes there are changes that are necessary to do once a building is in operation (Forcada et al., 2015, Fedoruk et al., 2015). When one moves away from the building scale to the city scale, there is an implication of a necessary monitoring period of the new use of a city development, which guides such as the SCIS guide neglect. This neglect indicates an assumption that once plans of a city are implemented they remain in place. Such an assumption ignores that citizen's interpretation of a development in a city maybe different to the original goals and intentions of the project.

#### **Adaptive learning process for sustainable development**

The '*adaptive learning process for sustainable development*' promotes a combination of expert-led/top-down and community based/bottom-up providing a holistic approach for developing indicators toward sustainable development (Reed et al., 2006). Such an approach enables the gaps of one approach to be closed by the other. For example, it is important to ensure communities provide input on how their community is developed and maintained, but the uniqueness of their requirements can be many and difficult to measure for monitoring purposes as well as compare on regional and national levels. On the other hand, the scientific results from the expert-led approach may not be widely usable at the community level (Reed et al., 2006). An adaptable learning process as shown in Figure 1 identifies steps that allow indicators to be developed through community-based approaches but allow experts to lead the monitoring and measuring of indicators overtime.

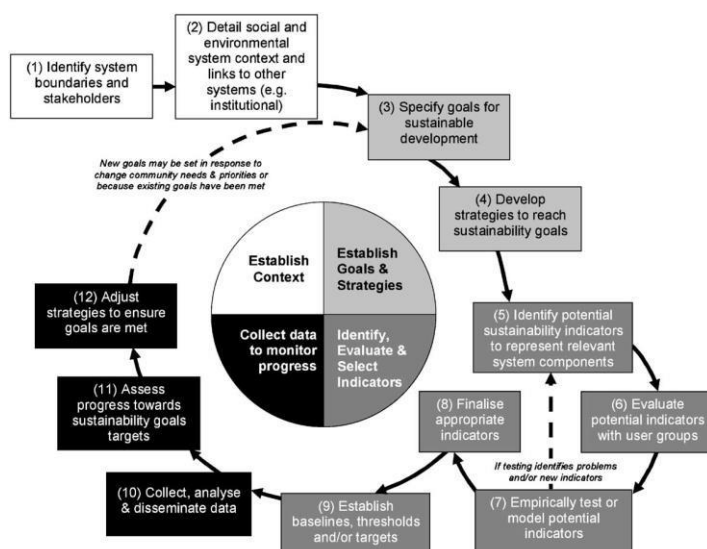


Figure 2 Adaptive learning process for sustainability indicator development and application – (Reed 2006, p414).

The combination of expert-led and community-based approaches facilitates the potential for both grass root origins and scientific rigor in developing social sustainable indicators, which links, to the wider context of city and region. However, expert-led approaches are not just about methods to ensure indicators are developed appropriately, but there are also expertise based on knowledge that influence how an area is developed and such knowledge needs also to be integrated into the adaptive learning process for social sustainable indicators in a community.

This process, like the other tools mentioned in this paper, focus on the planning process – however such a use of indicators and the proposed process of adaptive learning is quite shortsighted as it neglects operations. Sustainability is an ongoing process and successful sustainable areas in a city must be able to adapt to changing circumstances (Newman, 2007). In this way, it does not make sense to view that sustainable goals are achieved once plans are implemented within an urban district. The sustainable development of an urban area is dependent on the values and culture of the area so their interpretation and use of the area realistic decides on how sustainable the area is in use. This is something that needs continuous monitoring in order to adapt to their changing needs and ensure long term sustainability.

#### 14.2.6. Potential of social indicators which incorporate FM perspective

Haughton and Hunter (2003: 27) define 'a sustainable city is one in which its people and businesses continuously endeavor to improve their natural, built and cultural environments at neighborhood and regional levels, whilst working in ways which always support the goal of global sustainable development'. Thus a sustainable city is in a constant state of flux and in order to ensure that it remains sustainable this constant state of flux requires monitoring of services and needs of citizens, but cities are complex. The critical challenge for contemporary urbanism is to understand how to develop the knowledge, capacity and capability for public agencies, the private sector and multiple users in city regions systemically to re-engineer their built environment and urban infrastructure in response to climate change and resource constraints (Eames, Marvin et al. 2014). In terms of a neighborhood scale – the end-user is not just one user with diverse demands but a number of diverse end-users with diverse demands and therefore present challenges to combine diverse understandings on the same dwelling. Stakeholders view a building with different lenses depending on their role in the neighborhood (Karlsson, Lindkvist et al., 2013). There are not just diverse agendas making development of a holistic social perspective of a neighborhood challenging, there are also practical problems of developing sustainable neighborhoods. Stakeholders do not have an equal technical knowledge of a sustainable neighborhood. They are likely to be familiar with technical solutions like solar energy panels but may not necessary know the impact a solar panel has on their everyday life and infer meaning to them which may not be true (Lindkvist et al, 2014).

Indeed, as end users “do not speak the technical language used by professionals. They respond to products in immediate and direct way, which have little structure in terms of how their reactions are captured and translated into next generation products” (Gann et al., 2003, p.321). This sometimes means technical experts view end users of a neighborhood as knowledge deficient leading to their exclusion (Skjølsvold and Lindkvist, 2016) rather than considering the value of including end users input to understand their behavioral and functional needs within a neighbourhood context.

Holistic decision making requires a judgement about the relative importance of different impacts with the overall performance of options being considered (Alwaer and ClementsCroome, 2010). This necessarily include both social and technical dimensions. In the context of an urban environment, such impacts are necessarily social as end-users interested in living in a sustainable environment are core to realizing goals. By listening to the community and how they understand sustainability, it is possible to develop understandings to address reasons for causes of local (un)sustainability (Turcu, 2013). Indicators are a way of understanding how communities are currently operationalizing the concept of sustainability and their future needs and requirements.

More connectivity between policy commitments and local requirements are needed to tie the long-term holistic overview pushed within a sustainable outlook with immediate needs and requirements at both the local and national scales. At the same time the use of indicators should not be considered objective policy tools but more aim to accurately represent the complex urban system (Keirstead and Leach, 2007). Holman (2009) pushes for a service niche approach to indicators to avoid policy ambivalence and proposes that a service niches approach offers “a useful tool for creating boundaries and parameters around which the social construction of sustainability can take place” (Holman, 2009:373). The service niche approach to urban sustainability proposes examining crosscutting urban services such as energy as a basis for sustainable metrics which aims for a manageable subset of sustainable issues to be addressed on a city scale (Keirstead and Leach, 2007). However, while it is valuable to focus on services with specific measurements impact on urban sustainability, it is much more difficult to capture the social value of a community within a numerical value orientation. Social value is much more intangible than energy or water management measurements.

#### **Value capture model**

Social indicators could also be connected with the benefits for the community to better wellbeing, what is one of the main goals of sustainable environment. Value capture as a joint development model seeks to generate revenue by extracting a portion of the gains in the value of property that result from improvements to the built environment (usually in transportation projects). In the paper ‘Land Value Capture Model (LVC), what can FM learn from it?’ Temeljotov Salaj et al. (2018) present the opportunities for FM on the level of participating more actively in the development of new area to help to build a competitive and healthy area with high quality for residence, business and spare time, based on value capture model. LVC relates to increase value of land and help to build competitive areas (Zhao et al., 2012), which is seen as a huge opportunity for the strategic level of Facility Management (FM), when addressing property asset, urban FM, community based FM and new facility service opportunities. A value capture model by Temeljotov Salaj et al. (2018) contributes to the discussion of urbanizing FM by investigating the option of in-kind contribution (land, property) to project financing by owners, and its value through the project life-time. This complement the previous work done on new urban and community alignments and Best Value initiative by Roberts (2004), a community-based FM with the focus on long-term presence of a build asset in the community by Alexander and Brown (2006), and facilitating the creative environments in the perspective within urban planning by Larsen et al. (2011).

To attract all stakeholders to more active sustainable engagement, all stakeholders should see the social, economic and environmental benefits. The value capture model covers the governmental open issue to new financial investment models, which could be more economically sustainable, and being attractive for wider group of private investors (investors, owners, facility managers). Economic profit increases real estate value, and at the same time provides social benefits to neighborhoods, which become more attractive, safe, being designed based on their needs, better social infrastructure and services. FM is seen as an actor who can broaden services taking more social responsibility in the urban areas and focus on added value of neighborhoods

### 14.2.7. Discussion and Conclusion

The development of sustainable social indicators in the planning and design process has been valuable in identifying local needs, however there is a gap on how these needs are translated to action when and if linked to the strategic policy priorities. There is also a paradox in having sustainable indicator that only monitor local needs for the short-term rather than for the long term in-use period of a neighborhood in order to ensure sustainability. In reality within the perspective of sustainability, life-cycle of a neighborhood needs to be considered as the physicality of the neighborhood is permanent and how that is developed and shaped needs a long term perspective.

Traditional assessment tools such as BREEAM focus neglect the monitoring of sustainability of districts in use. We propose that the incorporation of FM thinking into indicators on a city scale could help create better links between local needs and strategic municipality decision makers. Such an approach could facilitate a more sustainable city as outlined by Alexander and Brown (2006) by

- ensuring that the physical environment does not deteriorate
- creating a platform for skilled employment opportunities
- the opportunity for genuine involvement of the communities in the design and management of services and the urban environment

The development of indicators of services in districts and ongoing monitoring of such indicators could ensure that building and infrastructure in cities are maintained for longer sustainability. The identification of people's needs at a local level which are linked to the strategic level could ensure that required behavioral changes by citizens is achievable at a service level which can make a real impact on carbon reduction targets. The tailoring of services to local needs increases the health and satisfaction of citizens within the district. The challenge is being able to set up early thinking of FM into planning and design stages so that sustainability becomes a holistic integrative and long-term approach rather than being time-limited within the structural phased approach of city district development.

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### **14.3. Lokale kopers in het Gronings aardbevingsgebied**

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#### **14.3.1. Samenvatting**

De aardgaswinning in Groningen is al meer dan 50 jaar van belang voor de Nederlandse welvaart. Zoals bekend hebben de aardbevingen en bodemdaling als gevolg van diezelfde gaswinning in de Groningse regio een behoorlijke impact op de woningmarkt. Veiligheidsrisico's, angst, imagoschade en de ervaren leefbaarheid hebben gevolgen voor het (economisch) perspectief van het gebied. Woningen zijn beschadigd en uit meerdere onderzoeken blijkt dat de huizenprijzen zijn gedaald en de regio onaantrekkelijk is voor potentiële kopers. Hoe krijg je als verkoper je waardeverlies gecompenseerd? Wie gaat er überhaupt nog in Gronings aardbevingsgebied kopen? En waarom wil je wonen in een gebied met zoveel risico's?

Onderstaand artikel laat zien dat er voor woningverkopers in het aardbevingsgebied nogal wat haken en ogen zitten aan de Regeling Waardedaling (ook wel waardecompensatie-regeling genoemd) van de Nederlandse Aardolie Maatschappij (NAM). De kopers van de verkochte woningen blijken vooral afkomstig te zijn uit de Provincie Groningen en in het bijzonder juist uit datzelfde aardbevingsgebied. Woningeigenaren willen kennelijk - ondanks de risico's- graag in het gebied blijven wonen.

#### **14.3.2. NAM-Regeling Waardedaling eerst nauwelijks aangevraagd**

Om het eventuele waardeverlies bij verkoop van woningen te compenseren is er sinds 29 april 2014 de 'Regeling Waardedaling' van de NAM. Deze compensatie wordt uitgekeerd als

de woning zich bevindt in de aardbevingsregio, daadwerkelijk is verkocht én geleverd na 25 januari 2013. In eerste instantie is de Regeling Waardedaling van toepassing op woningen in de acht erkende aardbevingsgemeenten, namelijk Appingedam, Bedum, Delfzijl, Eemsmond, Loppersum, Slochteren, Ten Boer en Winsum. Naderhand is de gemeente De Marne toegevoegd en sinds kort ook de gemeente Menterwolde en Hogeveen-Sappemeer (zie Figuur 1.).

De Regeling Waardedaling bestaat naast regelingen voor schadeherstel aan de woning, versterkingsmaatregelen, waardevermeerderingsmaatregelen op het vlak van duurzaamheid en uitkoopregelingen.



Figuur 1. De gemeenten in de provincie Groningen vóór 1-1-2018.



(Bron: [www.provinciegroningen.nl](http://www.provinciegroningen.nl), geraadpleegd op 11 juni 2018)

Opvallend is dat het aantal aanvragen voor de Regeling Waardedaling aanvankelijk achterloopt op het aantal daadwerkelijke woningverkoppen. Eind 2015 heeft meer dan 60% van de verkopers géén gebruik gemaakt van de Regeling Waardedaling (DvhN, 2015).

Tot en met 1 mei 2016 zijn 582 compensatieaanvragen in behandeling genomen. In 81% van deze gevallen is een financiële compensatie voor waardedaling aangeboden en in 19% niet (Jansen en Boelhouwer, 2016). Uit data-analyse van een transactiebestand van het Kadaster blijkt dat vanaf de startdatum van de waardecompensatieregeling tot 1 november 2015 er 2.548 woningen in de eerste negen aardbevingsgemeenten verkocht zijn. Sowieso meer dan driekwart van de verkopers (77,2%) heeft in deze twee jaar dat de compensatieregeling dan geldig is, geen gebruik willen of kunnen maken van de regeling. Het aandeel woningeigenaren dat per 1 mei 2016 daadwerkelijk een financiële compensatie heeft gekregen bedraagt dan hoogstens 18,5%.

#### 14.3.3. Wat houdt de aanvragers tegen?

Redenen waarom de huizenverkopers –als ze dan hun woning hebben verkocht- niet voor de Regeling Waardedaling gaan, is dat ze opzien tegen de complexiteit van de regeling, de gebruikte methode en vaststelling van de waarde ondoorzichtig is en de verwachte controleperiode nadien te lang wordt gevonden.

#### 14.3.4. Complexiteit van de Regeling Waardedaling: een blackbox

Uit een interview met een familie (april 2018) die wél een aanvraag voor compensatie heeft ingediend -nadat de woning zeven jaar te koop heeft gestaan- blijkt: *‘Wij hebben wel een compensatievoorstel gekregen, maar hebben begrepen dat heel veel aanvragers nul op het rekest kregen. De berekening van de compensatie was een boekwerk met allemaal bijlagen waar wij niets van begrepen. We hebben het voorgestelde compensatiebedrag maar geaccepteerd’.*

Uit een gesprek met een vertegenwoordiger van het Groninger Gasberaad (12 juni 2018) wordt de bepaling van de waardecompensatie ook letterlijk een ‘blackbox’ genoemd.

#### 14.3.5. Controleperiode voor de bepaling van de waardedaling duurt lang

Uit het onderzoek 'Wonen en leven met aardbevingen' (Smit et al, 2016) komt naar voren dat woningeigenaren een goede compensatie en duidelijke regelgeving willen. Bij een vergoeding van waardevermindering bij verkoop van de woning wil men snel zekerheid en duidelijkheid over de keuzemogelijkheden (vertrekken danwel opknappen). Het liefst wil men vooraf weten wat de compensatie is. *“Als je nu je woning verkoopt, weet je pas achteraf hoe hoog de claim is voor waardevermindering. Dit moet worden vastgelegd.”*

Uit het eerder genoemde interview bleek dat de verkopende familie het ongemakkelijk vond om –geruime tijd nadat de woning al is geleverd aan de nieuwe koper- buiten te moeten wachten terwijl de door de NAM ingezette taxateur de voormalige woning inspecteert en taxeert op waardeverlies.

#### 14.3.6. Bezwaren tegen de door de NAM gebruikte DeltaW-methode voor waardedaling

Bewoners vinden dat de regie over de Regeling Waardedaling uitgevoerd zou moeten worden door een onafhankelijke partij, niet door de NAM. Men ervaart nu dat de NAM de schadeafhandeling bepaalt en deze zo goedkoop mogelijk moet gebeuren. Ook zijn de normen die de NAM hanteert bij de afhandeling van schades niet voldoende duidelijk. Men heeft twijfels over de objectiviteit en voelt zich onder druk gezet om in te stemmen met compensatievoorstellen (Smit et al, 2016). Dat de huidige door de NAM gebruikte methode voor bepaling van het waardeverlies bij verkoop, de zogenaamde DeltaW methode van Momentum Technologies door bewoners als complex wordt gezien en ze bezwaar aantekenen tegen de methode lijkt niet zomaar uit de lucht gegrepen. DeltaW geeft het verschil weer tussen de geschatte marktwaarde van de betreffende woning in het risicogebied **op het moment van de verkoop** en de geschatte marktwaarde van dezelfde woning in een referentiegebied op basis van woning- en woonomgevingskenmerken. Vervolgens wordt het geschatte compensatievoorstel voorgelegd aan een team van taxateurs (Jansen et al, 2016).

Er zijn een aantal bezwaren tegen deze DeltaW-methode. Ten eerste is het lastig om een referentiewoning te vinden aangezien het woningbestand in het aardbevingsgebied een aantal bijzonderheden kent. Zo is het aandeel koopwoningen in het aardbevingsgebied (elf gemeenten) met gemiddeld 62% hoger dan de rest van Nederland (56%). Het landelijke karakter brengt met zich mee dat 85% van de woningen grondgebonden eengezinswoningen zijn, terwijl dit percentage in heel Nederland 65% bedraagt. De woningen zijn over het algemeen iets groter (25% groter dan 150 m<sup>2</sup> tegenover 20% in heel Nederland) en iets ouder: 72% van de woningen is vóór 1985 gebouwd tegenover 67% in heel Nederland (CBS, 2015). Ten tweede is het moment van vaststelling van compensatie van de waardedaling pas op of na het moment van levering en dus niet op moment van de verkoop (= tekenen van koopovereenkomst).

Bij het beoordelen van meerdere woningmarktmodellen ter bepaling van de waardedaling in het aardbevingsgebied (Jansen et al, 2016) blijkt bijv. dat bij vergelijking van de vastgestelde onderhoudsklasse (binnen en buiten) op het moment van afmelding door de NVM makelaar bij verkoop en naderhand bij de opname voor de Regeling Waardedaling –dat is na levering van de woning- er in 30% van de beoordelingen door taxateurs sprake is van een verschil van inzicht en dan meestal in het nadeel van de verkoper.

Ook de Stichting WAG (Waardevermindering door Aardbevingen Groningen) meldt in haar Nieuwsbrief 2018 dat zij uit haar bestand van inmiddels meer dan 5.000 deelnemers twaalf eigenaren die hun woning hebben verkocht bereid hebben gevonden om een rechtzaak tegen de NAM beginnen 'vanwege de lage vergoeding die wordt aangeboden na verkoop volgens de Waarderegeling van de NAM'.

Het bestuur van de stichting is het helemaal niet eens met de huidige Waarderegeling van de NAM en heeft meerdere bezwaren tegen de regeling ([www.WAG.nl](http://www.WAG.nl), geraadpleegd d.d. 19 juni 2018).

Jansen et al (2016) merken over het DeltaW model op dat 'doordat het hele proces geautomatiseerd verloopt, niet goed inzichtelijk is hoe de uiteindelijke regressiemodellen tot stand zijn gekomen en of de software wel altijd de

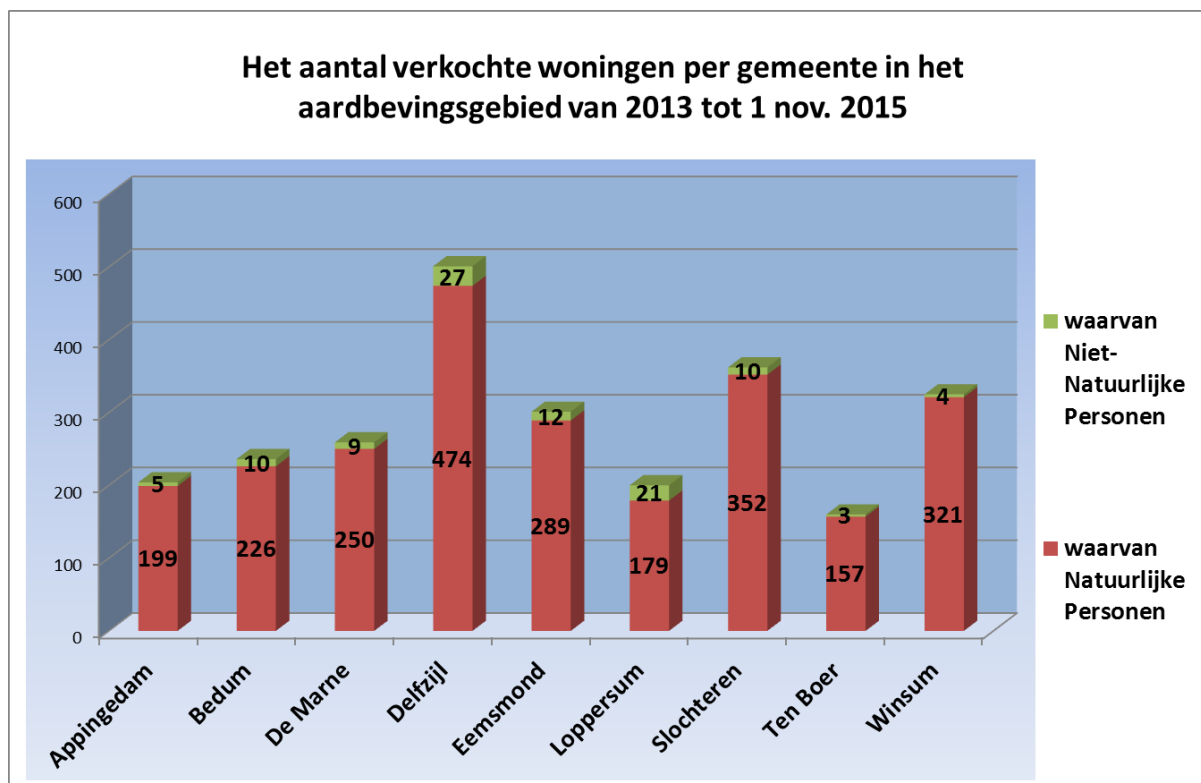
juiste beslissingen heeft genomen'. Op de vraag of het gevonden effect betrouwbaar is oordelen de onderzoekers dat de gebruikte methode verschillende onderdelen bevat die allemaal op zich onzekerheden bevatten. De vraag is nu wat een optelsom van deze onzekerheden voor effect heeft op het uiteindelijke compensatiebedrag en hoe betrouwbaar dit bedrag nog is. Ook wordt de objectiviteit van het gebruik van taxateurs in twijfel getrokken. De conclusie is dan ook dat door de complexiteit van de methode en de vele keuze- en beslismomenten het lastig is inzicht te krijgen in de methode en de geschatte compensatie voor een woning niet zo nauwkeurig te bepalen lijkt.

#### **14.3.7. Huidige stand van zaken ten aanzien van de waardecompensatieregeling**

Inmiddels is dit beeld van het aantal aanvragers wel gekanteld. Bekend is dat tot en met 1 mei 2018 er –inclusief de recenter aangesloten aardbevingsgemeenten Hoogezand-Sappemeer en Menterwolde- van de in totaal 3.707 ingediende aanvragen 62% uiteindelijk mét compensatie door de NAM zijn toegekend én geaccepteerd door de aanvrager (zie [www.nam.nl/feiten-en-cijfers/voortgang-waarderegeling](http://www.nam.nl/feiten-en-cijfers/voortgang-waarderegeling) geraadpleegd op 30 mei 2018). Dit betekent dat uiteindelijk bijna 40% van de indieners van een aanvraag voor compensatie aan het langste eind trekt of niet tevreden is over het voorgestelde compensatiebedrag. Uit het onderzoek van De Kam en Mey (2017) onder woningeigenaren waarvan het huis dan te koop staat, blijkt dat 44% niet van plan is een beroep te doen op de Regeling Waardedaling. Zij noemen onder meer als redenen de onrechtvaardigheid van de regeling en dat ze geen vertrouwen hebben in de regeling, in het bijzonder in de manier van waardebepaling van taxateurs. Naar aanleiding van gesprekken met individuele bewoners geeft het Groninger Gasberaad (inter-view 12 juni jl.) aan dat bewoners 'moe zijn van al die aanvragen voor allerlei verschillende regelingen en het invullen van al die formulieren hun gezondheid niet ten goede komt'.

#### **14.3.8. Lokale woningkopers in het Groningse aardbevingsgebied**

Om juist meer te kunnen zeggen over de kopers van woningen in het aardbevingsgebied hebben we -naast interviews met betrokkenen- een data-analyse uitgevoerd op een Kadaster databestand van notariële aktes van woningverkoop in (toen) negen gemeenten binnen het aardbevingsgebied gedurende de periode 25 januari 2013 (de startdatum van de Regeling Waardedaling) tot 1 november 2015. En 'Ja' er worden woningen verkocht!



Figuur 2. Het aantal verkochte woningen in het aardbevingsgebied over de periode 2013-nov 2015 naar gemeente en (niet)natuurlijke personen. (Bron: Kadaster, eigen bewerking 2018)

In totaal zijn over de periode 25 januari 2013 tot 1 november 2015 in het aardbevingsgebied 2.548 woningen gekocht, vooral door particulieren (96% door natuurlijke personen) en een klein percentage door niet-natuurlijke personen variërend per gemeente (zie Figuur 2).

Het voordeel van het Kadaster bestand is dat alle daadwerkelijke verkooptransacties bekend zijn en ook meer over de koper bekend is. Dit in tegenstelling tot een NVM bestand dat ca. 70% van de werkelijke woningverkoop registreert en vooral gefocust is op de verkoop (Francke en Lee, 2014).

De data-analyse laat verder zien dat van de particuliere woningkopers in het aardbevingsgebied over deze periode meer dan 96% afkomstig is uit de provincie Groningen. Hiervan komt bijna 98% uit het aardbevingsgebied. Overall gezien komen de particuliere kopers en de 'niet-natuurlijke personen' -denk hierbij aan de (hoofdkantoren van) BV's, NV's, banken, overheid en (woning)stichtingen- die een woning kochten in het aardbevingsgebied voor bijna 92% uit het aardbevingsgebied (zie Figuur 2). Zo blijkt volgens Boes (2016) uit NVM-gegevens dat vóór de beving in Huizinge (16 augustus 2012) 6,4% van de huishoudens die vanaf 2009 een woning in Loppersum hebben gekocht van buiten de Provincie Groningen te komen. Na de beving bleken er nog maar 5 huishoudens de sprong te wagen (1,3%).

Uit cijfers over de migratiestromen in Noordoost Groningen van Bouwmeester en Lamain (2016) is te herleiden dat 15% van de doorstromers en starters die in de periode 2003-2008 naar het aardbevingsgebied (9 aardbevingsgemeenten) zijn verhuisd dit een verhuisafstand van meer dan 100 km betreft. Over de periode 2009-2012 is dit percentage 14,4% en over 2013-2014 is het aandeel verder gedaald naar 11%. Kanttekening bij deze cijfers is dat in de verhuisbewegingen geen onderscheid te maken valt naar kopers en huurders.

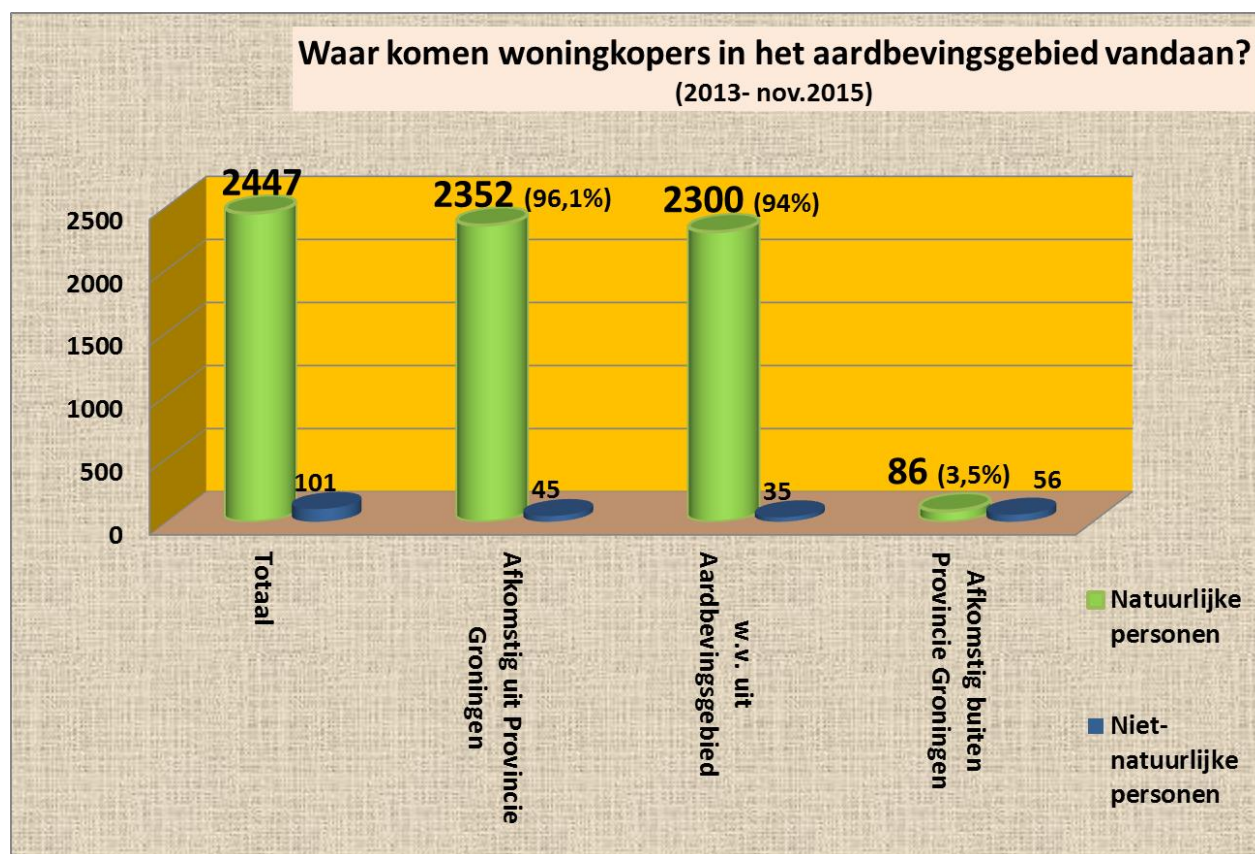
Bouwmeester en Lamain (2016) concluderen dat in het geval van de regio Noord-Oost Groningen sprake is van een 'behoorlijk regionaal georiënteerd' woningmarktgebied: ca. driekwart van de interregionale verhuizingen in aardbevingsgebied vindt plaats over maximaal 25 kilometer.

De Kam en Mey (2017) concluderen eveneens dat er als gevolg van de aardbevingen sprake is van een gesloten regionale woningmarkt. Het beeld dat er weinig kopers van buiten de regio binnen komen, komt overeen met onze resultaten. Een belangrijk deel van de transacties die wel afgesloten worden, vindt plaats tussen personen uit de regio.

Volgens de Groningse makelaars John Schokker (gesprek 12 april 2018) en Harm Smit van

Ing H.H. Smit Makelaardij (gesprek 28 mei 2018) kwamen vóór 2012 de kopers van de (grote) Groningse woningboerderijen vanwege de lage prijzen vooral uit de Randstad, nu moeten de verkopers het van de lokale markt hebben. Het stigma effect van de aardbevingen wordt in het onderzoek van De Kam en Mey (2017) bevestigd. Het imago van het aardbevingsgebied zou er voor zorgen dat kopers buiten de regio wegblijven en het hele gebied mijden (zie Figuur 3).

Imago-schade is in feite in geen enkel woningmarktmodel apart meegenomen, terwijl uit het gesprek met het Groninger Gasberaad blijkt dat men er in Groningen vanuit gaat dat dit beeld over mogelijke veiligheidsrisico's nog jaren gaat duren en in feite 'onbetaalbaar' gaat worden.



*Figuur 3. De woningkopers in het aardbevingsgebied naar eerdere woonplaats over de periode 2013-nov 2015 verdeeld naar natuurlijke en niet-natuurlijke personen. (Bron: Kadaster, eigen bewerking 2018)*

#### **14.3.9. Waarom blijven wonen in Gronings aardbevingsgebied?**

Volgens de Groningse makelaar Jan Palland in Harms (2015) zijn er een aantal pluspunten van de provincie Groningen te noemen, namelijk de ruimte en de relatief lage prijzen. Voor de Groningse woningeigenaren spelen ook andere factoren een rol. Woningeigenaren ervaren het wonen in Groningen nog steeds als prettig, ze hebben hier hun sociale contacten en willen -ondanks de bezorgdheid- heel graag in het gebied blijven wonen (Smit et al. 2016)

De redenen waarom kopers na de beving in Huizinge voor een woning in Loppersum kiezen zijn divers (Boes, 2016). De meest genoemde beweegreden is in volgorde van belangrijkheid de grootte van de woning, werk, relatie/echtscheiding, opgegroeid in de omgeving, familie en de omgeving.

Volgens makelaar Jan Palland van NVM Groningen (www.rtlz.nl van 18 januari 2018) verkochten "de Groningse makelaars in het jaar 2017 met z'n allen net iets meer huizen dan het jaar ervoor. Het jaar 2013 was echt een dieptepunt. We hadden drie negatieve factoren tegelijk: de crisis, de bevingen en Groningen is natuurlijk een krimpgebied. Gelukkig gaat het steeds beter", ziet hij nu. "Een groot deel van de huizen verkopen we aan mensen die binnen een straal van twintig kilometer wonen."

#### **14.3.10. Conclusies en aanbevelingen**

We concluderen dat de Groningse aardbevingsregio nog steeds zijn aantrekkelijkheid heeft voor lokale bewoners en kopers. Het betekent dat hier duidelijk sprake is van een gesloten regionale woningmarkt. Aan de andere kant bereikt de Regeling Waardedaling van de NAM en de bijhorende compensatie nog onvoldoende verkopers en is de bepaling van diezelfde compensatie nog te zeer een Black box. Eén van de aanbevelingen is daarom om de gebruikte methodiek om de waardecompensatie te bepalen breed gedragen wordt, simpel is, transparant en individueel toe te passen is.

Ons advies aan de overheid en NAM is om de bewoners in het aardbevingsgebied ruimhartig te compenseren voor het geleden waardeverlies van hun woningen of ze nu wel of niet zijn beschadigd, of ze nu wel of niet zijn verkocht. Dit helpt om de leefbaarheid, regionale ontwikkeling, economie en aantrekkelijkheid van het gebied te verbeteren. Er is behoefte aan nieuwe, ruimtelijke oplossingen op lokaal niveau. Hiervoor is kennis over innovatiever, aardbevingsbestendiger bouwen en versterken nodig.

Het is daarom van belang om te weten waarom bewoners er willen blijven wonen, wat ze zelf willen als oplossingen en wat mensen naar de regio trekt. Vanuit deze gedachte kan er weer een 'innovatieve en positieve vibe' door het gebied waaien.

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#### **14.4. Program Hybrid as a Model of Sustainable Preservation**

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##### **14.4.1. Abstract**

###### **Problem Statement**

In the debate on the sustainable protection of the city, the idea of constructing "a city over the city" is the basis of all urban interventions today. In this context, interventions on architectural heritage are an integral principle of urban projects. Transformations are a compromise between preserving existing ones and creating new forms, a compromise that adheres professionalism and the wider public of the users.

###### **Purpose of Study**

The transformation is in correlation with the change of social reality. When existing typologies lose their primary meaning, they are getting transformed (case of conversion of objects). In this process, the form-function relationship is abandoned and it enters an architectural research in the field of transformative typologies that would respond to the contemporary human needs.

###### **Methods**

The transformation influenced by the changing social conditions is imminent. Hence, the architectural research in the field of programmatically integrated objects represents the concept of program and space transcription of conventional modernist paradigms expressed through appropriate typologies.

The prefix "trans" is justified by its orientation to the future, as it linguistically shows the terms that are compiled (transmuted, transfigured, transformed, etc.).

###### **Findings and Results**

The new programmatically integrated architectural concept through disparate programs should achieve a formal transcription of modernist autopoiesis and achieve social cohesion of different types of users.



#### 14.4.2. Introduction

In this paper a main effort is given defining the Oppositions between Social and Ideological differences of the problem of Sustainable Preservation. Therefore two general aspects should be analyzed. The first aspect is validation of former architectural style/narratives, historical and cultural value and second, the problem of architectural transcription of former style asocial sustainable model. Key assumption of bridging the cultural identity loss of transforming societies is preserving its character of **monumentum**. Rethinking the narratives of former Architecture from the perspective of theoretical opposition between rationalism and empiricism of stratum of meanings, we tend to create theoretical considerations where differences become a model of preserving the Identity.

...Any language, including architectural as carrier of information through its semantic narrative and syntax of formal historical style should be considered a key model of Identity.

The period of modernism brought many radical techniques, and created an ideological and physical discontinuity in history. The idea of modernism as a vehicle of reforming society comes to an end in the last decades of the previous century. Far from modernistic paradigm, where each person has been counted into a standard or agronomy and considered a user of the building without a possibility to create a differentiation from the others, was unable to express their self-consciousness. Transcription of former architecture becomes a tool of deconstruction of modernistic ideology. The processes of formal and ideological transcription of former architecture give the opportunity of involving each individual through the participatory process of self-responsibility. The result should be counter-reform of ideology of modernism by shifting the meaning and iconography of historical narratives important for the identity. Ether being national or social ones, the ontological purpose of architecture is in the spirit, where the form appears from the very beginning with its collective (objective) spirit, having connected with the historical distance. The traditional form and its dedicated feelings last because of the tradition which is strongly inherited by the feelings for that form (sentimentality).

...The purpose of research conducted by the project is proposing possible architectural scenarios as opposition of model or experiment.

Contemporary critical panoptic of institutionalized program, realized through the “mask” of architectural practice creates the same, as a service of particular ideologies. Such example was modernism in architecture realized by different models and experiments. One of the recent criticism defined by Eisenman as the *diagrams of interiority (structural relationship)* was characterized by the desire to find internal rules and mechanisms for the discipline without any contact with the exterior world. This modernistic paradigm was largely used and served as a tool to shift history toward ideology.

#### New Collectivism

The program is a component of Architecture that could be situated in virtually any form. This aspect gives us the opportunity to consider the approach of creating scenarios, and to operate through the methodology of transformative typology. The differences between aprioristic methodologies of self-preferentiality, which create the particular typologies, turn the recourse of Architecture far from the external factors. The methods such as transformation, transfiguration and transcription, become a tool to reflect upon the instability of history (*anteriority – former, before*). The program is not perceived as a fixed quantitative operational diagram, but as one of the most efficient generators of atmosphere, life, usage and identity, the program is to be an icon (Lacaton, Vassal).

The first aspect is the urge of creating an event related to public realm. As we mentioned earlier, the identity represents itself in collective memory, and a person could identify himself only if he belongs to that collective. Collectivism is related to Publicity, where the medium acts as an event. The scale of space is characterized as immensity, and the elements of interiority, should propagate the spirit of gathering, simplicity and multiplicity of meanings with collective identification. Today the interests are commonly expressed through the participatory actions. Community should decide about sustainability of their needs. The common method of survey usually offers the information for further development of the program.

#### 14.4.3. Architecture as a response to social changes

In this chapter an architectural and building codes shall be described. The first example is a building for collective dwelling for railway workers. The building is in **Early Modern style** and represents the societal and economical status/conditions of population in the City/Country from the period between the 1<sup>st</sup> and 2<sup>nd</sup> W.W. and after the War. The architecture of the building inherited the craftsman's' knowledge and represents an example of transgression toward the Modern Socialist idea of dwelling. The Ideology recognized behind the program structure illustrates the buildings' concept as Social Capacitor. These relations between the social and political ideology, could be described through the relations of the buildings' morph syntax and its program.

The second example of Elementary School, describes the social conditions in the Country after the earthquake. As a part of the Yugoslav federation, serious transformations were made in the State, such as UNESCO donations, large reconstructions of the city of Skopje and also Urban Plans for the City Center were developed. The Socialistic approach where each child should have the opportunity for education reflects the educational program structure and building codes. The Architectural style of school concepts of **Modernism** represents the idea of rationality, serialism, and technological aesthetic of brut concrete. (Fig. 1)

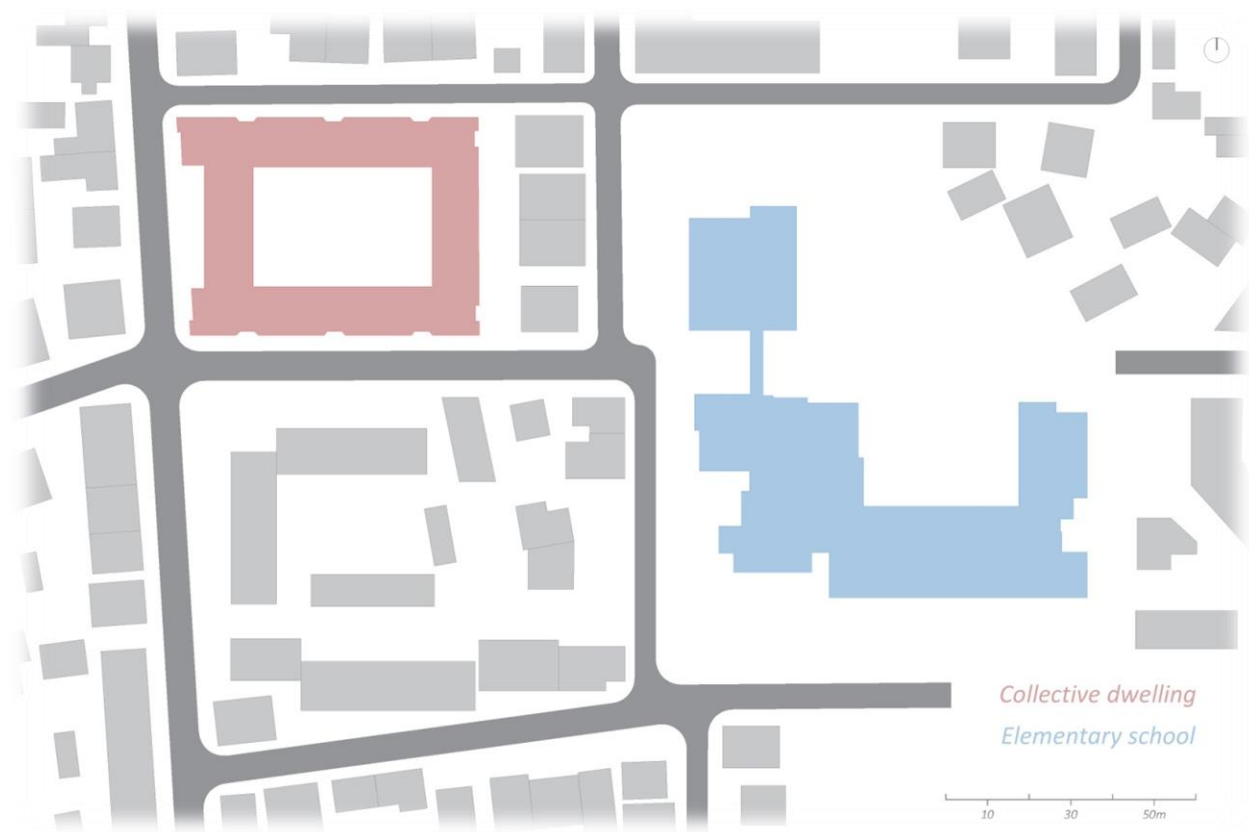


Figure 1. Site map of both buildings, (by authors)

The Railway Building is the first model of collective dwelling in the City of Skopje, it appears as a direct response to the need for changes in social relations. The building takes place in the postwar period, after the end of World War II when society is in a strong transition and reinforcement. The social model is changing from a primarily agrarian, through the new socialist paradigm in an industrial collective model. Such changes require the appearance of new spatial relations and structures in the city as a form of collective dwelling in an organized community. Under the pressure of the new social actuality there is an accelerated growth of the city form which aims to receive new users and successfully integrate them and transform them into a new social paradigm. As a basic element of the city, buildings are determining the social changes. Architecture becomes the main technique

through which the new socialist idea for the collective forms of living is realized, productively and above all the collective modalities of the relations of the interaction of the users in the space. The need for creating new architectural models and typologies that are a source of already studied such models of socio-realistic forms of collective dwelling is actualized. Here the connection with Russian constructivism emerges, which as a model persists decades before. In such a society, social and political context, the Railway Building is created. It is a response to the needs of the collective as a form of living. It embeds in itself a social structure of the new layer created in the society, the working class. Building as a community is the model that is being a transcript in the new spatial plan. The building becomes not only an existential living space, but also a place for socialization and strengthening the cultural awareness of the new beneficiaries in order to integrate them into a socialist social model based on the ideas of collectivity in all layers of the community. Spatial response to the new form of collective housing is the emergence of a hybrid program. Beside the housing units as the dominant program segment, there are also common spaces that carry the idea of public and semi-public space upon themselves. They are spaces through which new relationships between users are realized in order to impose their awareness on collective ownership and collective goods. The idea of leveraging the individual in a community is spatially enhanced by linking housing units through galleries that are orientated in a common inner courtyard that is the center of a new collective form. Newly built program islands that build public programs and stimulate and suggest at gatherings of users in order to strengthen the unity at the level of the railway community are emerging through the constructed structure. Close to the social status, work habits, economic power and the views on new trends, users are easily organized into the collective form of housing, suggested through the spatial appearance of the building. (Fig. 2)



*Figure 2. Frontal Elevation of the Railway Workers' building. (Photo montage by H.M., S.M., S.C., A.G., D.K., and C.P.)*

The stylish building is considered a determinant of the impact on the architectural scene between the two world wars, the early modern. The author Mihail Dvornikov is an architect who comes from the Russian scene on the territory of Yugoslavia and actively works in Skopje. As an impetus of Russian constructivism, the idea of collective housing is transcribed in the program contents of the building and in its plan, but the physical appearance is in harmony with the local sensibility in that period of the architectural scene in Yugoslavia and decorates the facade panels in fragments, so the object receives neo-classical stylistic features that appear in larger shape in other buildings built in this period in the city of Skopje. The building itself also contains influences from the Austrian, Viennese architectural scene that binds it to the Jugend style and the secession through facade masses largely purified from decoration, but in a classic matrix and through repetitive elements and decoration in fragments such as the appearance of a completed crown, emphasized entrance parties, rustic processing of the parapet zone on the ground floor, and fields with relief decoration on the western entrance facade. The building is representative of the early modern and historical artifact that actively speaks about the stylistic language of the period in which it occurs. Its value stems from the fact that it is the only example of a completely closed perimeter block built only from an object with a patio that partially opens to the entrance party and the front yard. Such a typology has not been repeated in the metropolitan tissue and therefore throughout the years of its

existence it has been an interest of many authors who observe it from various diopters and make different conclusions about its qualities and weaknesses. (Fig. 3)



*Figure 3. Side Elevation of the Railway Workers' building. (Photo montage by H.M., S.M., S.C., A.G., D.K., and C.P.)*

The building today re-represents society and the new lifestyle. It is a scene on which changes occur. Its facade panels become backdrops on which the individual manifests his needs, the building lives uproar and constantly changes their fragments. The users are constantly trying to personalize their space and adapt it to their new needs. The idea of collectivism disappears and each individual reaches his own way of life and spatial realization of his new needs. New structures appear that make contact with the old built mass in a variety of ways, careful or reckless. Some of them respect the value of the stratum structure and successfully upgrade it, but most of them completely deny it, and with their physical appearance they violate the innate concept and the integrity of the object expressed in its fragments. Most of the drastic changes occur to the inner courtyard by closing portions of open galleries. Such new elements interrupt the movement, and violate the wholeness that in certain fragments does not become recognition. All changes demonstrate the need to increase the existential space and the desire to evolve and upgrade the home due to changes in the social status, family boom, changes in the users of the space, the community no longer exists. The users are only tenants of a building, and in no way different from tenants in other buildings, there is no longer an idea that unites them in a community through social relations and belonging to a social group within the society. They are unified spatially through the existing structure, but do not identify them as a group or community. They live in the Railway Building, but they are not recognized as residents of the Railway Building. The individual lifestyle and new social trends are read on the facade walls of the building. Owners who are economically more powerful dictate the changes, while those in the lowest strata of the new capitalist social paradigm leave their fragments of the whole in the original state susceptible to the tooth of time. Facade panels become collages representing the economic power or powerlessness of the building's users, they are a direct picture of what is happening behind the wall mass, what are the new scenarios of space use, they are an indicator of the extinction of collectivism and the birth of a new social reality that erases the collective values and puts the individual in the first place as a focus on the events, needs and desires. The building from one body becomes a collage of fragments; in the true sense of the word it lives through time. The city is a living organism and is constantly changing in order to ensure growth and its shape is not consistent, but if the city is the big stage on which the buildings exist, then they also change with it, and they grow in the search for new urban scenarios created by the user. Gestures on buildings, formal or informal, change their physical appearance, promote them or degrade them, but always represent the new needs of users and new forms of spatial relations in the existential spaces, in homes. Here is the role of the architect, he can perceive the whole and the unity of the building as a fragment from the city and offer thoughtful and projected solutions that will allow transition into new forms of spatial relations and new scenarios. They will transcribe the existing objects reading and valued their qualities and values, and thus preserve the image of them as a collective memory of the city and will not be disturbed by their original concepts because they are places where the users are identified and are strongly imprinted on the mental maps of the inhabitants of the city. They are spatial references in the metropolitan tissue and are most closely linked to the collective memory of the city as the artificial context of human needs. Each part of the great mosaic has a value that needs to be recognized and valued, and in accordance with the

needs reprogrammed and physically transcript into a new shape that carries the already-built structure and imprinted in the previous forms.

The elementary school "Johan Heinrich Pestaloci" is a part of the post-earthly reconstruction of the city of Skopje, located in the city center. The primary school with its location builds a continuity of the site, because before the earthquake, the "Petar Petrovic Njegos" elementary school was situated on the same site. The only element that the new building retains from the existing object is the area with its irregular boundaries. The author of the building is the Swiss architect Alfret Roth. He gets the task to plan a new primary school, as a donation from the Swiss government that decides to help the distressed city of Skopje. Alfred Roth is known to the worlds' architectural scene as one of the masters for this typology of objects. He works closely with prominent Swiss pedagogue Johann Heinrich Pestalotsi who helps him with the design of the new spatial scenarios of educational buildings. Roth dedicates a part of his career trying to upgrade the existing conceptual solutions for these kinds of objects. He sees architecture as a medium through which changes in social scenarios and basic means should be made, therefore the life of man can be promoted not only in a new, existential space - home but also in all the spheres of social life through the new typological solutions of public buildings. He dedicates his career to education facilities and just before the project of the elementary school "Johann Heinrich Pestalotsi" in Skopje leaves behind a series of successful projects in this area such as the elementary school in Berkeley, USA, the elementary school in "Raidhov" in Zurich and the kindergarten in Wangen Ar. He begins to explore the new spatial plans of education facilities through a multi-level primary school competition project in Alsterten Zurich. The solutions that they have applied for the first time in their competition project are consistently developing further in their future projects and implementations. The elementary school "Johan Heinrich Pestalozzi" in Skopje is innovative and unconventional not only in tracing the plan, but also in the appearance of new programs within the building that will improve the educational process of the students. The construction system is designed so that the facility can receive seismic effects without damaging its parts or the whole. The school's program opens the possibility of new courses in teaching as well as new methods of learning, where the pupils are involved in all kinds of event throughout the teacher's program. Roth uses the modernist paradigm of perception of social relations as an idea that should be shown to students from the very youngest age to encourage them to explore and discover new horizons. (Fig. 4a, 4b)



*Figure 4a. South Elevation of the elementary school, (Photo montage by Fiola S. and Hazra M. students of faculty of architecture)*



*Figure 4b. North Elevation of the elementary school, (Photo montage by Fiola S. and Hazra M. students of faculty of architecture)*

Judging by its appearance, the object represents structuralism as part of the postmodernist paradigms and this language is generated by the strongly dissected spatial volume structures in the form of pavilions, where each represents one program unit. The plan also follows one of the strongest hypotheses of modernism "Form follows function" through the strongly expressed spatial definition of program groups that receive a form that represents the program entirety and through its formal spatial appearance. The material rests the object in brutalism as the direction of the postmodern, and that directly determines the style of the object as observed from the outside. The facade panels are made out of reinforced concrete with a large structural breakdown, which represents the hybrid program and the division into program groups. The building is composed out of four main program fragments: a three-level tract course, a tract with two-level laboratories and one underground level, a sports hall and a lecture hall with accompanying contents. The classroom as the basic cell that generates the form of such a typology of objects within itself also carries the idea of innovation by leaving the conventional rectangular proportion of the relationship between the width and the length of the premise, and crossing into a square form with equal sides that defines a flexible spatial plan and involves new spatial scenarios and relationships among students during the course. The laboratory tract upgrades the school with a new program that should bring students closer to practical teaching methods and enable them to get in touch with a wide range of areas of the scientific education process in order to further focus on specific areas of specialization from the earliest age. The sports hall is separated from the body of the school and it makes a connection with the whole through a covered porch, which allows it to be used outside of the school program, for internal users. All the halls are with smaller heights and clearly suggest which age group the space is meant for. The aula is designed so that it can receive public events that go beyond the common usage. The perimeter disposition of the program groups forms a semi-closed school yard that can include part of the teaching process as well as public events outside the program of study, this spatial disposition does not disturb the movement within the settlement and the yard follows the street that strikes on both sides of the school's peak in the form of a pedestrian path. Greenland and the open space around the building only complement the high standard of the school and humanize the micro-location of the building that is located in a dense urban structure. The classrooms are planned as a group of two rooms on the floor, around a central staircase, avoiding the long and boring school corridors, easily grouping the square classrooms and granting them one multifunctional space that occurs at the entrance of each classroom. The lack of long corridors allows the classrooms to be double-oriented and illuminated with direct light from the south and diffused light from the north, rising the standard of a classroom. (Fig. 5)



*Figure 5. East and West Elevations of the elementary school, (Photo montage by Fiola S. and Hazra M. students of faculty of architecture)*

This program hybrid and innovative facility makes sure the school remains popular today and without any major interventions it actively works and successfully survives by meeting the new needs of the pupils. The main problem with the building is its aging, which over time due to inadequate maintenance has damages in most of



the façade panels, carpentry, floors, and inventory. This shows that, although innovative and before its time, this building still needs changes, its original beauty and functionality fades because of the damage and it slowly begins to reflect the educational process and the active use of the building. A transcription is needed, but is the reconstruction enough to extend the lifespan of the building, do the upcoming users have the same needs as the previous ones, is the building capable of keeping pace with social changes and respond to them spatially. The facility needs a sustainable reprogramming in order to maintain its authentic value and keep its functionality and continue to satisfy the needs of users. With the addition of new programs, additional hybridization and external visitors, the existing space capacities will be strengthened and improved. The school's management is already making efforts to achieve economic sustainability and started renting its existing capacities during the non-teaching hours. The reprogramming process within the facility has started, but in order to be a true response to the new requirements, all spatial features of the facility and the new needs of users and the environment should be examined, assumed and tested by new social scenarios that at some point can be generated by such architectural structure. What are the new programs that will not violate the basic concept of the building and will not compromise the main program and the existing users as a very sensitive social category and how to respond spatially to the new scenarios, where people can socialize and recognize themselves. Such a thought-provoking approach is a tool through which all possible spatial responses will be methodically examined which would generate a sustainable method of an object that is very important not only because of its architectural and engineering value, but also because of the mental image of all generations of its users and its place in the social mosaic on the city map.

#### **14.4.4. Transcription in Architecture**

The problem with “sustainable preservation” of former architecture is both design and research challenge for architectural practice today. This practice of transformation is considered as a normal way of city evolution in order to keep a pace with humans’ needs. So far practice has been defined with terms starting with the prefix “re” – reconversion, rehabilitation, renovation or reconstruction. The preference of using the prefix “trans” has proven to be reasonable, striving for commitment in the future, while being contained in terms such as transmuted, transfigured, transformed etc. The appearance of this form of use relies on economical and cultural changes. (Robert, Desmoulines, 2005)

Recomposing an existing building and giving it a new program, does not mean transforming its identity, on the contrary It means respecting it, which first has to be determined in order to be pointed out correctly. However the identity of an object is not always found in its esthetic or historical value, knowing that architectural transcriptions are also applied on plane buildings. Most of the reconverted buildings offer a quality and quantity of space pointing out their true potential, the void in between. To make a transcription understands emphasizing the importance of internal space, the true subject of change when the external appearance remains identical. Every transformation should be a result of a logical constructive affiliation of the previous structure, and most importantly a result of a collective awareness. Denying this logic leads to fragile and false architecture.

#### **Users’ experience**

To find a proper way to carry on the identity of a building means understanding the users’ relationship with the collective. Identifying with an object understands creating a strong bond between its presence, strongly ingrained in the context, and the users’ self-awareness for its existence. Every possible transformation must tend to strengthen the bond, imposing a disrespectful method of intervention can lead to uncertainty, insecurity and discomfort for the individual. This sense of presence must be considered when proposing a sustainable scenario.

#### **Methodology of sustainable preservation**

Considering economical and social aspects for sustainable preservation, it is necessary to develop a theoretical base which should help generate an architectural concept. In the last decade western countries have developed methods for evaluation of existing buildings. Discussing program, the access for evaluation of reconstructed buildings should be adjusted to all kinds of objects. Defying a methodology is a starting point for understanding and changing the direction of the theoretical study. In our case, both observed object propagate their

individuality as a result of a historical sequence of the neighborly architecture. Social capacitors are always born within-the metropolis, yet strengthening the center when public space becomes attractive.

### **Definition of hybrid buildings**

As a possible way of maintaining the living spirit in a certain space “genius loci”, hybrid buildings offer a coherent balance of parts, relationship between form, function, technology, society etc. The individual program of hybrid buildings is connected to each other and shares similar intensities, which cannot be single use, focusing on the public space, users’ interaction and spatial arrangement. Hybrids are formed as a collision and immersion between public and private space. The permutations of strains are infinite; a new hybrid must contain a logical segregation of program. If incorporated right, hybrid buildings can be considered models for revitalization of the cities. (Fenton, 1985)

### **The power of communication**

Throughout history urbanism has declared housing as the most dominant structure of the city grid. Characterized by the concept of privacy, dwelling prevents the external space in between from becoming public. Our first model of transcription, the “Railway workers” building, (Fig. 6) designed in the 1930’s, is a rare model of an existing social capacitor, combining public and private space, a residential building enriched with a cinema and a kindergarten as a part of its monumentality, both no longer functional. Nevertheless a different kind of privacy occurs in the Elementary School, our second model of transcription, where internal space becomes more approachable to the public. (Fig. 7)



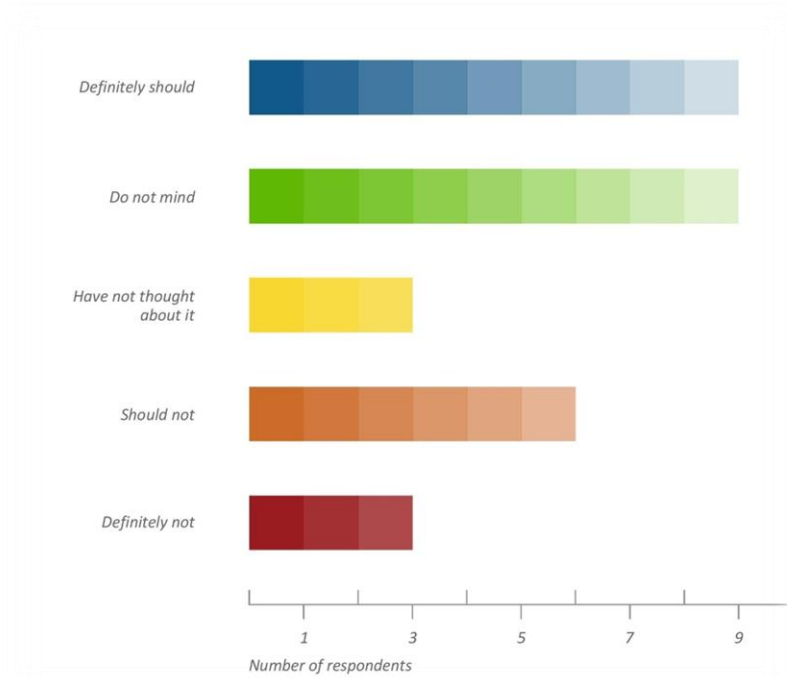
*Figure 6. Collective dwelling, (Railway workers) Early Modern style. (Model by Aleksandar A. Tome D. M=1:100)*





*Figure 7. Elementary School (built after the Earthquake 1963) Modernism. (Model by Aleksandar A. Tome D. M=1:100)*

The idea of bringing back the spirit of the place, is followed by analyzing, and gathering information about the current stands of these buildings, interviewing the residents, teachers and students, users of these areas. The result of the communication with the respondents had a key impact over forming our opinion about the new program hybrid. When being asked if a possible reconstruction should respect the originality of the appearance of both objects, 95% of them shared our opinion. On the question if the public space of the residential building should be open for use for external visitors, 60% of them gave a positive answer, 30 % think the opposite, while 10% have not thought about it. (Fig. 8)



*Figure 8*

30% think that external visitors have been destroying their atrium, while 70 % agree that a possible rental of the public space within should not disrupt their privacy, meaning that the assumption of a new program narrows down. Some of them mentioned that even if a new reconstruction was about to happen it was not going to solve their problem with parking, since the building stood tall long before any norms and standards for urban planning were declared in the region. Among a few questions, they were being asked about their favorite part of the building, and the answers were all similar, but inspiring, emphasizing the importance of their patio, describing it as an open kindergarten for their children, a box full of greenery providing peace and harmony. It is quite obvious that the residents want what is best for their long-term domain.

On the other hand, 86% of the interviewed teachers in the elementary school gave a positive answer, when being asked whether the school should rent its existing space for other features besides teaching. (Fig. 9)

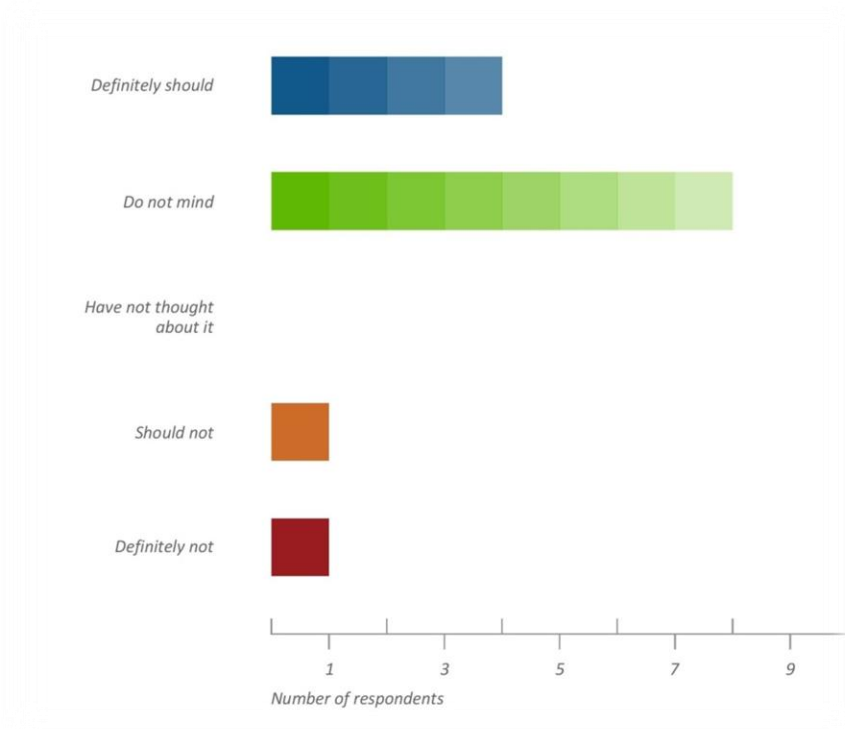


Figure 9

Furthermore, they came with a proposal to rent the lecture hall and the gym during the non-teaching hours. In that case, the incoming funds can be an additional support for various educational features. The same respondents were questioned about their opinion if the existing appearance/volume of the school should be upgraded with new public content. 20% explained that a new program must have an educational character, in order to follow the concept and organization of the school. (Fig. 10)

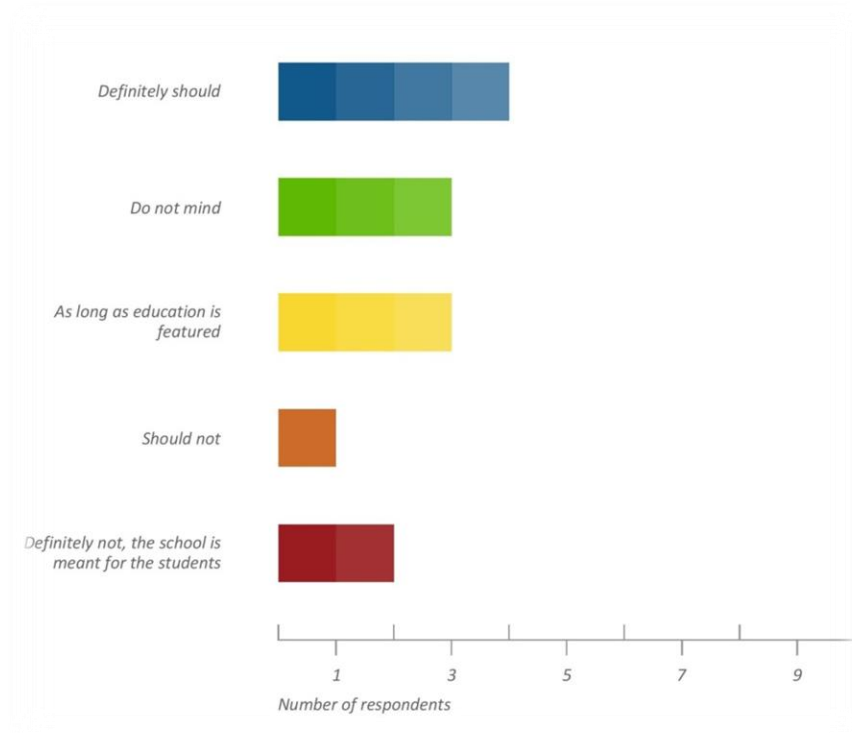


Figure 10

Among the respondents, we also gathered some information from the pupils themselves, regardless of their age and grade. Their answers seemed pretty honest and logical, since their presence makes the existence of the building make sense. On the question what might improve the current usage of their second home, they listed couple programs including a refectory, a modern library enlarged with a reading room where they can do their homework after class, also a new chemistry and biology lab and a computer center. Some of them even mentioned renovating the school yard as an important place of event.

Gathering all the information, assumptions, recommendations, interviewing the individual users of both objects, had a key impact over defying the new program of our hybrid. Moreover, the analysis of our surrounding - knowing all kinds of activities and programs nearby, also made a huge impact over our access in taking the next step, which is generating different forms of various suitable content. Expressing ourselves through a range of scenarios, we want to incorporate possible program that includes cultural and commercial architecture, educational and sports, as far as healthcare and hospitality architecture. We strongly believe than any additional content should complete the task of both separating and uniting internal from/with public space.

#### 14.4.5. Postcards from Utopia

The following virtual interventions show a variety of scenarios where the new program becomes one with the former architecture.

The building is completed with contemporary architecture inscribed in its originality where the existing structure is considered a basis for a new structure. (Fig. 11.a, 11.b)



*Figure 11.a. Frontal photo montage (by authors)*

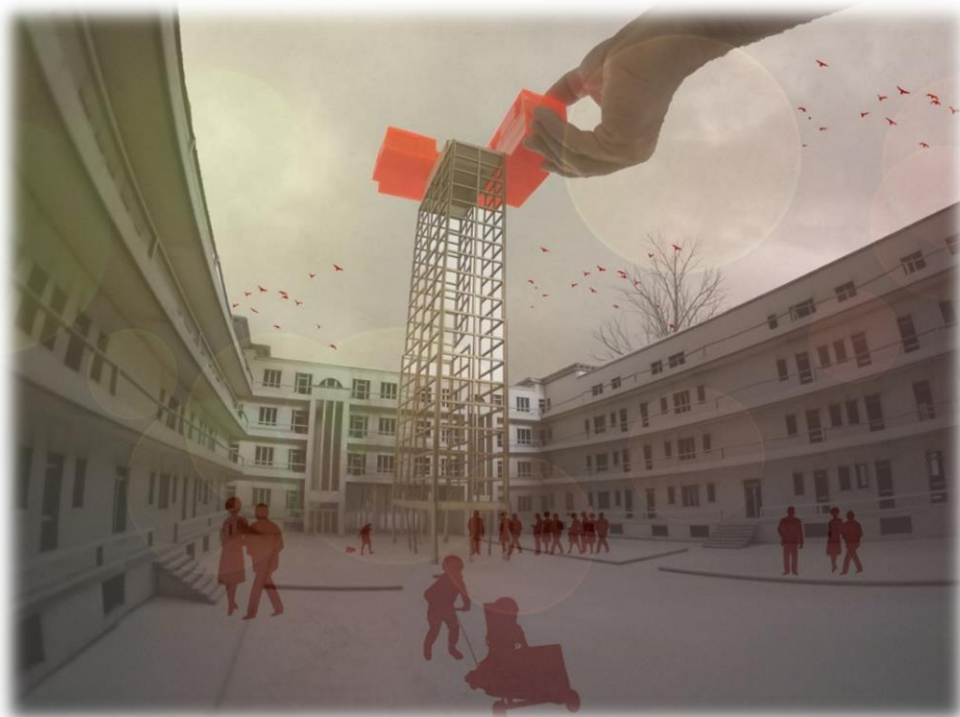


*Figure 11.b. Side photo montage (by authors)*

The building is restored with care and knowledge, adapting its new program to the existing space configuration, where two separate structures create collective form of coexistence. (Fig. 12.a, 12.b)



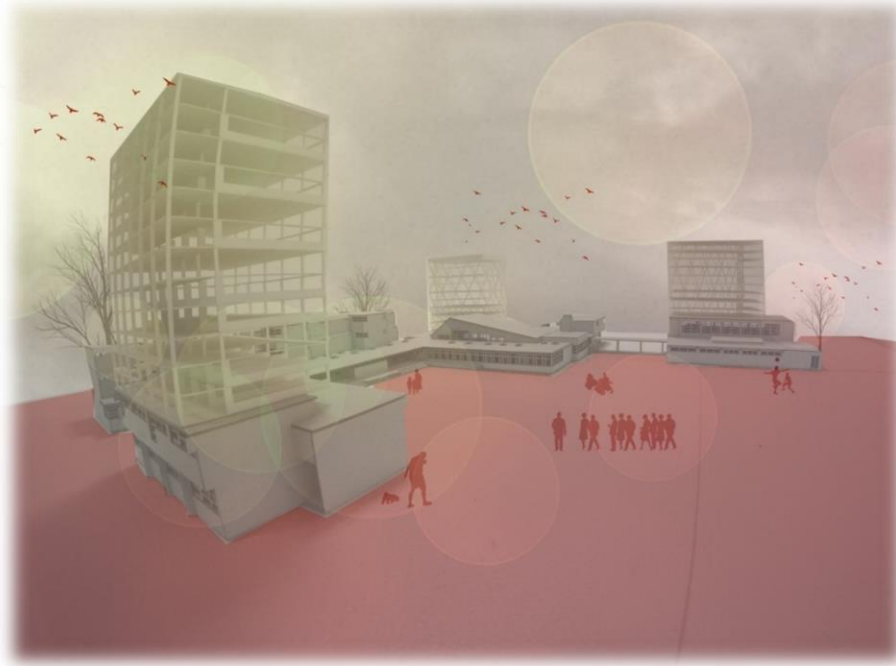
*Figure 12.a. Internal courtyard, photo montage (by authors)*



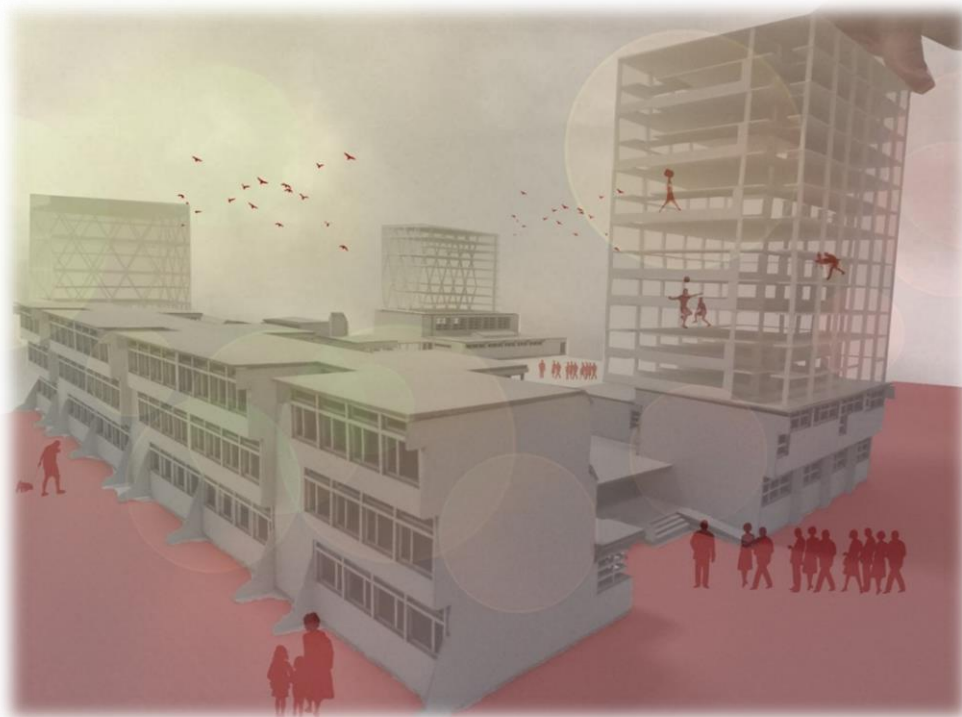
*Figure 12.a. Internal courtyard, photo montage (by authors)*



The elementary school Heinrich Pestalosi is a subject of modification by vertical aggregation of the new program. The new structure remains transparent creating a new independent composition, by not disturbing the pre-existing context. (Fig. 13.a 13.b)

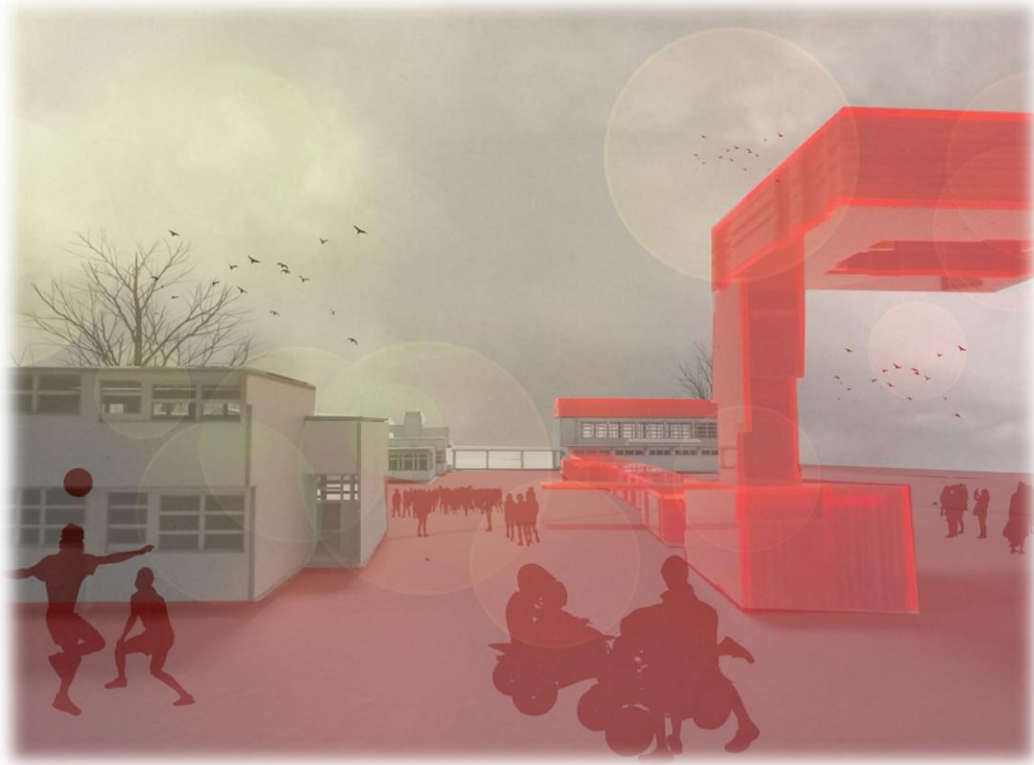


*Figure 13.a. School yard, photo montage (by authors)*



*Figure 13.b. School yard, photo montage (by authors)*

The building is a subject of modification of its volume; the new program is knitted to the existing capacities of the school, implementing contemporary architecture with such level of scale emphasizing the importance of positive space. (Fig. 14.a, 14.b)



*Figure 14.a. School yard, photo montage (by authors)*



Figure 14.b. School yard, photo montage (by authors)

#### 14.4.6. Conclusion

The problem of sustainable preservation represents the theoretical and practical application of knowledge of former architecture and contemporary critical positions in architecture. This research presents the methodological approach suggesting that each problem regarding social sustainability has its particular characteristics. Since architecture is considered as communication medium, its final immanence should have social and ideological meaning for the community. The program and form has a social meaning only if it emerges from the community needs and their participation on a local scale. Each building is a monument. Since the culture of building is rooted in the taste or style of its time it becomes a part of the memory of that time. Its capacity to remember defines the ontology of the spirit. The form develops from that spirit which is an objective one and has the continuity with the historical distance. The examples presented in this paper denote the possibility of architecture to institutionalize the collectiveness and self-identification through the architectural space.

Social sustainability is a contemporary tool inherited from the community with different historical, cultural and ethnical strata's. The transcription of former architectural poetry emphasizes the catalytic social processes and creates cohesive community.

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## 15. Workspace

## 15.1. Workplace Maturity Model©

Quantifying the degree of workplace agility.

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### 15.1.1. Challenges in workplace strategy

Success in the (digital) era depends on transforming how work is done to create effective workplaces and improve employee experience, satisfaction and productivity. There are a number of external and internal challenges that managers are faced with. External challenges, for example, are changing demographics like ageing workforce, more freelancers, disruptive automation, robotising and the war for talent. Internal challenges like Gen Y, the growing need for privacy and work/life balance also play a huge role in this industry. Organisations slowly recognise the necessity of adapting their office workplaces to the changing needs of their employees. However, the question still remains: how successful are organisations in adopting their workplaces to these? The underlying challenge of this question centers around business managers who still regard offices only as a space to house their employees. They are not aware of the strategic dimension and potential effect on business outcomes of working environments. The nature of work also changed. Technological advances such as smartphones, video conferencing and instant messaging have encouraged a shift in the workplace. This led to the need to create an effective workplace, that encourages productivity, close collaboration and peak performance at reduced costs. Nowadays different tools can deliver workplace insights to managers, which enables them to make informed decisions. But what insights should you consider, when looking at your workplace strategy and what tools do you need? These crucial questions will be discussed in this article.

According to Measuremen's Occupancy Benchmark, Office workplaces are underutilised by as much as 32% on average.

### 15.1.2. The Perfect Model does not exist

The last decade numerous new theories in workplace strategy emerged, all perceived to be the answer to various workplace challenges. However, the ongoing debate regarding the best model currently still exists. In their 2017 study<sup>29</sup>, Annette Kämpf-Dern and Jennifer Konkol refined and combined international literature analyses on workplace strategy. They concluded most experts agree that a workplace strategy should be tailored to suit the needs of an organisation and its employees. In the next paragraphs, the challenges mentioned in the introduction will be addressed and linked to the right set of tools.

### 15.1.3. The Workplace Maturity Model©

The Workplace Maturity Model© is a unique and innovative model. It helps organisations gradually adapt their workplace to the changing internal and external challenges. It does so by providing metrical insights, which ultimately leads to satisfied and therefore more perceived productivity. The model has been developed in-house by Measuremen, using our 15+ years of experience within the workplace arena worldwide. It gives unique insights into the usage and possibilities of office space across all industries. The term "Workplace Maturity" relates to the degree of workplace agility, from costs efficiency, to activity based working, and finally organisational fit. Each level of maturity has its own set of key performance indicators (KPIs) to steer and control the adapting and optimising of a workplace strategy. Numbers tell the tale and using some simple calculations to support your ideas for change and convince others to follow you.

In 2016, the European average is € 8.927,- according to the Occupier Cost Index (OCI) from Colliers International.

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<sup>29</sup> Konkol, J., & Kämpf-Dern, A. (2017). Performance-oriented office work environments in Germany – Concept testing in a real life change project. 24th Annual European Real Estate Society Conference.

The Workplace Maturity Model© is supported by data of over 2.000.000 unique workstations and meeting facilities. The model helps to support implementation of new workplace concepts such as Activity Based Working and relates to personal characteristics, functional needs and individual preferences. As such, it enables facility, human resources and real estate managers alongside professionals in other fields, to make data-driven decisions and elevate workplace knowledge towards a higher standard.



#### 15.1.4. The Basics

The Workplace Maturity Model© contains three dimensions, namely various levels, steps and areas. Some of the levels overlay the areas. The areas can be found through the model at all times. They represent the areas where the data is collected and where the workplace strategy can be adjusted. The Maturity Model© can be applied in three different areas, namely, means, activities and people. Each area has a different focus point going from ‘non-threatening optimisation’ to ‘thethings-we-do’ to ‘personal development’.

##### Area 1 - Means

This area contains square feet of office space, desks, chairs, meeting rooms and all other furniture. By starting here we can facilitate change in a non-threatening way and gain momentum to proceed to the next two areas. We create insight in costs reduction potential. <sup>[L]</sup><sub>[SEP]</sub>

##### Area 2 - Activities

This stage focuses on the the activities and tasks employees perform around the workplace. Data must be gathered on the actual use of different workplace types and make activity analyses that break down to departments or team levels. <sup>[L]</sup><sub>[SEP]</sub>

##### Area 3 - People <sup>[L]</sup><sub>[SEP]</sub>

This is where we get personal and use data for coaching and professional development. Actual behaviour on an individual level means that a workplace can be designed around individual preferences and based on the tasks an employee performs.

Within these areas there are different levels. Each organisation has a different starting point, depending on your workplace strategy. Once a new level is reached, periodical check ups are needed in order to fine tune your work environment and maintain a healthy fit between the three areas. In order to reach a higher level you need to take

certain steps. Each level describes the situation your organisation is currently in. It's quite easy to assess for yourself at what level your organisation is.

The Workplace Maturity Model<sup>®</sup> has four different levels: Acknowledge, Validate, Manage and Optimise.

#### Level 1 - Acknowledge

The organisation has just been made aware of the change in the work environment. Change starts with a single spark. Most of the time this means a manager is inspired by something. It might have been an article, an inspirational seminar, a Youtube movie or someone who advised them in recent history. The manager wants to be part of this change and helps the organisation to advance. The manager believes this change is inevitable and feels the organisation should participate in this worldwide trend. However, he or she is not sure how to execute these innovations, but is willing to learn and eager to share any findings with colleagues and stakeholders within the organisation. A new workplace concept can bring more freedom, motivation and efficiency for employees and thus have a positive impact on the bottom line. In order to make this strategic change work, support needs to be created within the (higher) management of the organisation. Building a business case and start some small or low impact measurements, will help provide tools for the manager to bring insights to the (higher) management, gain trust and momentum to drive the change.

#### Level 2 - Validate

In this level the organisation has a widespread knowledge of workplace concepts and what this could mean for their own organisation. There are multiple stakeholders indicated and strong relations are built through all hierarchy levels with the organisation and Measurement. A solid business case is discussed within multiple meetings on different levels within the organisation. Possibilities and threats are heavily debated and pro's and con's are being exchanged. The discussion changes from cost reduction to organisational improvements. The business case is being extended towards profit gain, working up to employee satisfaction and perceived productivity.

#### Level 3 - Manage

This level indicates that an organisation has started implementing a new way of working. Initial investments have been done. The organisation (openly) asks herself 'is the new way of work successful?' There could be different forms of implementation, for example Working Digital, Working From Home, Flex Working or Activity Based Working. Each organisation has to decide on a preferred way of working and data collected by Measurement services can help decide what the best strategy will be.

#### Level 4 - Optimise

These organisations have the need for a permanent insight to the actual performance of their workplace (and other locations worldwide). They fine tune the workplace and their workplace strategy based on metrics and actual needs of their employees. They found a great balance between employee preference and (global) management to keep cost to the essentials and investments to increase satisfaction and productivity. The organisation builds up reliable knowledge on what works and what doesn't work within their workplace and validate the data with workplace ratios (within a decision making portal). This enables them to anticipate changes on a global scale but also on local changes in workforce or workforce retention.

For each level of maturity you need different data and metrics to look at. For instance: if you are not sure whether or not there is enough support to implement a new workplace strategy or some form of flex working, hot desking or even activity based working you should build a business case. Our method of measuring focuses on the right fit of the area which means that every area requires a different method of measuring. By providing you with the right tools at the right time you will be able to make the right decisions at the right time improving your workplace as you ascend all four levels of workplace maturity. With over half a million workplace registrations,

we have learned when an organisation needs different kinds of insight. We have gathered workplace data and digested the data into sizeable chunks for you to consume.

Meeting rooms have an average occupancy rate of 38%. Their utilization rate is even lower, 12,2%.

#### **15.1.5. Conclusion**

The Workplace Maturity Model© provides the tools to justify the investment in workplace insights for each degree of workplace agility. It sheds a new light on successful workplace strategy. This can positively impact the cost of office space, employee satisfaction and productivity. Side effects include a positive impact, talent attraction and retention. To conclude the question raised in the introduction; how successful are organisations on workplace agility? You can be successful in optimising your workplace if you have the right tools and insights to make comprehensive, justified decisions about the work environment and can generate the momentum in your organisation to achieve change. Like Darwin once said: it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself.

Interested to see what workplace insights can benefit your organisation? Give us a call at +31 (0) 20 370 4734 or sent an email to [info@wemeasure.com](mailto:info@wemeasure.com).



## 15.2. Physical and psychological approaches that improve workplace health

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### 15.2.1. Abstract

**Purpose:** Since today's lifestyle requests a greater commitment to work, it is necessary to develop a healthy workplace environment in which individuals will feel satisfied and fulfilled. Stress related problems in the working population are a growing concern, since they are associated with many physical and psychological disorders. Workplace conditions play a crucial role in preserving workers' mental and physical health. Negative environmental conditions, such as poor indoor air quality, inappropriate thermal conditions, crowded feeling, lack of natural light, poor ergonomics or workplace safety and others as well as the exposure to negative psychological situations, such as bullying, fear from job loss, psychological harassment, low social support and others, can have a significant influence on the stress level and consequently on health and well-being. There are different approaches that can be used to minimise the job-related stress level and improve the quality of life.

**Design:** The present research focuses on the literature review analysis of specific elements of the work environment and behavioural habits of employees at their jobs with the aim to discover the characteristics of the workplace that have beneficial effects on the individual.

**Findings:** Results show, that different workspace factors have an impact on the satisfaction of employees and consequently on their health.

**Practical implications:** The research covers a growing need for the focus on health and well-being issues.

**Originality/ value of paper:** Implementing better workplace condition aspects will introduce better base for a value for the employees and employers.

**Keywords:** Stress, Occupational health, Workplace, Work environment, Quality of life

### 15.2.2. Uvod

Na delovnem mestu nas večina preživi precejšnji del dneva. Po podatkih Sodexo, Workplace trends 2014 (povzeto po Haworth, 2014), je to 54% časa, ko smo aktivni. Zaradi tega je pomembno, da se v delovnem okolju dobro počutimo. Spodbujati in razvijati je potrebno takšno delovno okolje, kjer se bomo počutili zadovoljni in izpolnjeni. Ali lahko to dosežemo z nepremičninskim okoljem? Slovenski in tuji avtorji pravijo, da lahko.

Namen naloge je primerjava desetih izbranih člankov, ki obravnavajo tako specifične karakteristike delovnega okolja, katere pozitivno vplivajo na vzorce obnašanja zaposlenih in na izboljšanje duševnega stanja, kakor tudi vpliv drugih dejavnikov, predvsem stresa, na duševno zdravje zaposlenih.

### 15.2.3. Izboljšanje duševnega stanja – stres in preventiva

LaMontagne skupaj z drugimi avtorji (2014) pravi, da so duševni problemi pogosti med delovno populacijo ter da so delovni pogoji pomemben faktor za rešitev le-teh. Povzema, da delovni pogoji in duševno zdravje vplivata drug na drugega recipročno in longitudinalno. Preprečevanje izpostavljenosti stresnim delovnim situacijam, kot so na primer nesigurnost za delo, bulizem, psihološko nadlegovanje, nizka socialna podpora, organizacijske krivice in nepravilno razdeljevanje nagrad, ter obenem izboljšanje psihosocialne kakovosti dela bi lahko preprečilo precej duševnih problemov. Za dobro duševno zdravje zaposlenih predlaga enoten pristop, ki je sestavljen iz treh ključnih dejavnikov, in sicer preventive, promocije pozitivnih aspektov dela in delavčevih sposobnosti ter pomoči pri obolelosti.

Stres na delovnem mestu je vse pogostejša težava delovno aktivnega prebivalstva. Medtem ko se LaMontagne z drugimi avtorji v svojem članku osredotoča na psihološke vidike reševanje problema slabšega duševnega zdravja med delovno aktivnim prebivalstvom, Jain et.al.(2013) ugotavljajo kakšen je posredni vpliv predanosti, tako zaposlenega podjetju kakor tudi njihove percepcije predanosti organizacije njim samim. Ugotavlja se povezave med stresom delovnega okolja, duševnim zdravjem ter psihološkim dobrim počutjem. Za analizo raziskovalnega problema je bil na izbranem vzorcu vprašanih operaterjev klicnega centra v Indiji uporabljen splošni vprašalnik o stresu (ASSET – A Shortend Stress Evaluation Tool).

Kot uvodoma ugotavljajo, ima stres, povezan z delom, negativen vpliv na delovno učinkovitost ter na fizično in duševno stanje zaposlenih, vključno z mišično-skeletnimi in imunskimi težavami. Stres se izraža kot izčrpanost, občutek brezobzirnosti, cinizma, odtujenosti od dela, neučinkovitosti in pomanjkanja dovršenosti. Stres je bil analiziran iz štirih različnih vidikov, in sicer kot spodbuda, odziv, interakcija med spodbudo in izzivom ter kot izvršitev. Ugotavljale so se tri glavne dimenzije vprašalnika, to so »percepcija dela«, »odnos do organizacije« ter »zdravje«.

Rezultati raziskave so pokazali, da ima lahko podpora podjetja oziroma percepcija predanosti in podjetja zaposlenim direkten pozitiven učinek na zdravje in dobro počutje zaposlenih ter da lahko celo preprečuje negativne učinke stresnih dejavnikov.

Lottrup et. al. (2012) se prav tako dotaknejo problema stresa in s stresom povezanih bolezni v odnosu do zunanjega zelenega okolja na delovnem mestu. V članku ugotavljajo, da so drugi avtorji že v prejšnjih raziskavah ugotovili, da obstaja pozitivna povezava med dostopom do zunanjih zelenih površin na delovnem mestu in zmanjšanjem stresa. Namen raziskave članka je ugotoviti, če je dostop do zunanjih zelenih površin na delovnem mestu povezan z znižanjem stresa zaposlenih in (pozitivnim) odnosom do delovnega mesta.

Zanimivost te raziskave je, da so se pojavila odstopanja pri moških in ženskih anketirancih. Rezultati so pokazali pomembne povezave med fizičnim in vizualnim dostopom do zunanjih zelenih površin, pozitiven odnos so delovnega okolja ter zmanjšan nivo stresa pri moški. Za razliko od moških anketirancev, pri ženskah ni bilo zaznati vpliva med dostopom do zunanjih zelenih površin in nivojem stresa. Ugotovljena je bila še ena razlika med spoloma, in sicer je bil pri ženskah pozitiven odnos do delovnega okolja povezan z zmanjšanjem nivoja stresa, medtem ko pri moških ne. Povzemajo ugotovitev, da je zunanje zeleno okolje pridobitev za dobrobit in zmanjšanje stresa zaposlenega, vendar igra tudi spol pomembno vlogo pri dojemanju koristi takšnega okolja.

Glede na ugotovitve izvedene raziskave priporočajo podjetjem, da povečajo vizualni stik oziroma pogled na naravne elemente iz delovnega mesta ter omogočijo zaposlenim fizični dostop do zunanjih zelenih površin. S tem se bo prispevalo k zmanjšanju stresa ter stimuliralo pozitiven odnos zaposlenih do njihovega delovnega okolja. V zaključku avtorji predlagajo, da bi lahko bile opravljene podrobnejše raziskave oblikovanja zunanjega okolja (vrsta vegetacije, razporeditev, ipd.).

Iz vidika izboljšanja delovnega okolja je pomembna tudi preventiva. Z namenom, da bi zaposlene pritegnili k promociji in varstvu zdravja na delovnem mestu, Henning et.al. (2009) priporočajo enovit program, ki vključuje participativno ergonomijo, kjer bi bili delavci vpleteni v oblikovanje lastnega delovnega okolja ter promocijo zdravja. Programi bi se izvajali pri različnih deležnikih kot delavnice in bi lahko nadgradili obstoječe ergonomske ali varnostne programe.

Kelloway in Barling (2010) se v svojem članku dotakneta pomena vodstvene funkcije v podjetju. Kot ugotavljata, je kakovost vodenja oziroma vodstva podjetja povezana z različnimi učinki zaposlitvenega zdravja in varnosti. Pozitivni učinki se izražajo v psihološki dobrobiti in varnem okolju, negativni pa v stresu, srčno-žilnih obolenjih, delovnih poškodbah in nesrečah. Predlagajo, da bi se uvedlo izboljšanje vodenja podjetja kot bistven in učinkovit pripomoček za zagotavljanje duševnega zdravja zaposlenih. Gre za drugačen pristop izboljševanja duševnega stanja zaposlenih, saj v tem primeru ni neposrednega vpliva na glavnega deležnika procesa, to je vodjo, temveč se vpliv pozitivnega vodenja odraža na zaposlenih. Pozitivne oblike vodenja imajo kot že rečeno pozitivne učinke na zaposlene. Eden od priporočljivih načinov vodenja podjetja je transformacijsko vodenje. Gre za stil vodenja, ki združuje štiri načine vedenja, in sicer pravičnost, navdih, intelektualno stimulacijo in pozornost posamezniku.

Kogi (2005, 2012a, 2012b) v svojih člankih prav tako poudarja pomen preventive v delovnem okolju ter predlaga preproste, nizkocenovne ukrepe, ki so izvedljivi na lokalnem nivoju v manjših podjetjih. Namen teh ukrepov je izboljšanje delovnih pogojev in posledično produktivnosti zaposlenih.

Osredotoča se na izboljšave delovnega okolja ob upoštevanju osnovnih principov ergonomike na različnih tehničnih področjih. V spodnji tabeli so v prvem stolpcu prikazana tehnična področja, v drugem osnovni principi ergonomike ter v tretjem predlagani ukrepi za izboljšave.

| Technical Areas          | Basic Principles                             | Options for Small-Scale Workplaces                                                            |
|--------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------|
| Materials handling       | Fewer and faster handling actions            | Organized multilevel storage, pushcarts, mobile racks, mechanical lifting                     |
| Workstation design       | Less strenuous and more efficient operations | Easy to reach materials; elbow-level work; use of fixtures; coding by colors, signs, labels   |
| Machine safety           | Barrier-free space with fewer mistakes       | Machine guards, partitions, interlocking, warning signs, simple labels for controls           |
| Work environment         | Nonhazardous space with amenity              | Use of daylight and lights, better microclimate, isolation of hazard sources, local exhausts  |
| Welfare facilities       | Refreshing and hygienic facilities           | Clean drinking water, hygienic toilets, lockers, washing facilities, resting corners or rooms |
| Work organization        | Good teamwork and restful schedules          | Coworker meetings, combined tasks, rotation, breaks, enough shift intervals                   |
| Environmental protection | Reducing waste and recycling                 | Waste-saving materials, separate collection, establishing recycling routes                    |



*Slika 1: Predlagani ukrepi za izboljšanje delovnega okolja (Kogi, 2005)*

Kogi poudarja tudi pomen izobraževanja, tako zaposlenih kot vodij, ki je prilagojeno lokalnim razmeram. Dejavnosti so usmerjene s poudarkom na participativnem pristopu, tako da se sodeluje in širi primere dobre prakse v lokalnem okolju.

#### **15.2.4. Izboljšanje duševnega stanja – dejavniki fizičnega okolja**

Z izjemo Kogija in Lottrupa et.al., ki v svojih člankih opredeljujeta tudi fizično okolje, se je večina avtorjev izbranih člankov ukvarjala s stresom ter preventivnimi dejavnostmi, ki vplivajo na izboljšanje duševnega zdravja. V nadaljevanju sta povzeta dva članka dveh podjetij, ki se ukvarjata s fizičnim okoljem in njegovimi izboljšavami za zagotavljanje boljšega duševnega stanja zaposlenih.

HOK je mednarodno oblikovalsko, arhitekturno, inženirsko in planersko podjetje, ki je na svojih spletnih straneh objavilo članek o organizaciji delovnega okolja, tako da se poveča učinkovitost, zdravje in dobro počutje.

V članku izpostavljajo deset ključnih elementov, ki pozitivno vplivajo na delovno okolje in produktivnost. To so temperatura prostora, dostop do narave, pogledov in dnevne svetlobe, dožemanje prostora in njegove spremembe, barve, nadzor hrupa, (pre)natrpanost, ergonomija, kakovost notranjega zraka, možnost izbire ter angažiranje zaposlenih.

Toplotno udobje dosežemo s pravilno kombinacijo temperature, pretoka zraka in vlage. Idealna temperatura v delovnem okolju (pisarni) je 21,6 °C (+/-1°). Pozitivno je, če imamo nadzor nad uravnavanjem toplote, zato se svetuje, da se to delavcem omogoči. Priporočljivo je tudi uporabiti premična okna in zasenčenje.

Prisotnost dnevne svetlobe in možnost aktivnega ali pasivnega stika z naravo pozitivno vplivajo na dobro počutje, zato je priporočljivo oblikovati prostore tako, da je čim bolj prisotna naravna svetloba. Prioriteta naj bo tudi na lepih pogledih. Priporočljivo je tudi oblikovati zunanje površine, ki jih uporabljajo zaposleni in spodbujati njihovo uporabo.

Ljudje imajo po večini raje spreminjajočo in raznoliko vizualno podobo prostora, ki jo lahko dosežemo z ustvarjenjem teksture z uporabo različnih naravnih materialov. Dolge poteze hodnikov naj bodo strukturirane z barvami, umetninami, vzorci, ipd.

Ljudje drugače dojemamo barve glede na našo kulturo in življenjske izkušnje. Barve uporabimo strateško glede na učinek, ki ga želimo doseči v določenem delovnem okolju (npr. modra je pomirjujoča in spodbuja kreativno mišljenje, rožnata sprošča, itd.) in ne glede na osebne preference. Z barvami lahko tudi vplivamo na svetlost prostora.

Hrup je lahko zelo moteč element v delovnem okolju. Pri oblikovanju poskušamo ločiti hrupna območja od mirnih con in temu prilagoditi tudi razpored delovnih mest.

Občutek natrpanosti in gneče je neprijeten in pogosto povezan z občutkom stresa. Prostor naj bo oblikovan tako, da ga dojemamo odprtega, kot so na primer, svetlejši prostori, lažji stropi, ogledala, in podobno. Lahko si pomagamo tudi z orientacijo v smer, kjer je manj ljudi in odpiranjem pogledov proti oknom.

Ergonomija poskuša kar se da prilagoditi delovno okolje uporabniku. To lahko dosežemo s prilagodljivo opremo prostora, brezžično tehnologijo in različne spodbude, ki potencirajo hojo, uporabo stopnic in podobno.

Kakovost notranjega zraka je pomemben dejavnik, ki vpliva na zdravje. Priporočljiva je uporaba notranje opreme (talne obloge, zidne barve, pohištvo in ostalo), ki ne vsebuje škodljivih snovi. Zagotovljeno naj bo primerno gretje in hlajenje ter vzdrževanje naprav. Pozitivno vpliva tudi usposobljeno čistilno osebje ter dodatek rastlin.

Možnost izbire organizacije in razporeditve samega delovnega prostora je pomemben dejavnik, ki vpliva na kakovost delovnega okolja.

Angažirani zaposleni so bolj produktivni in zadovoljni z delovnim okoljem.

54% aktivnih ur v dnevu preživimo na delu (Sodexo, Workplace Trends, 2014), zato je pomembno, da se vzpostavi holistični pristop pri oblikovanju delovnega okolja. Haworth je, prav tako kot HOK, projektivno podjetje, ki se v svojem članku (2015) osredotoča na izboljšave fizičnega okolja in pomen postavitve človeka v center dogajanja. Kot že mnogi avtorji prej, je tudi v tem članku omenjen stres kot eden glavnih vzrokov za duševna obolenja in srčno žilne bolezni. Po podatkih svetovne zdravstvene organizacije (WHO) bosta do leta 2020 ti dve bolezni glavna vzroka obolenja zaposlenih. Posledično se pojavljata še prezentizem in absentizem, ki zvišujeta stroške zdravstvene blagajne.

Delovno mesto, ki zares podpira dobro počutje zaposlenih, mora zagotavljati holistični pristop tako na fizičnem in duševnem področju kakor tudi na področju dobrega počutja na delovnem mestu. V primerjavi s prejšnjim člankom tudi ta predlaga nekaj konkretnih rešitev izboljšav fizičnega okolja, ki vplivajo boljše počutje zaposlenih. Predlagane rešitve so razdeljene na tiste, ki izboljšajo duševno zdravje in tiste, ki izboljšajo fizično zdravje.

Med predlaganimi rešitvami, ki vplivajo na izboljšanje duševnega zdravja so:

- Povečanje možnosti uporabnika za prilagajanje delovnega prostora (fleksibilna osvetlitev, premično pohištvo),
- Uvajanje naravnih prvin (pogled, rastline, naravni materiali, odprti prostori)
- Vključiti čim več naravne svetlobe (upoštevanje cirkadiani ritem, primerna osvetlitev)
- Zmanjševanje vpliva hrupa

Med predlaganimi rešitvami, ki vplivajo na izboljšanje fizičnega zdravja so:

- Spodbujati spremembe položaja telesa in gibanje tekom delovnega dne (visoke mize, spodbude za hojo)
- Uporaba ergonomskih principov v vseh prostorih
- Zmanjšanje prisotnosti škodljivih snovi (naravni, neoporečni materiali)
- Razviti občutek skupnosti (zdravstveni programi, družabni prostori)

#### 15.2.5. Zaključek

Iz pregleda izbranih člankov je razvidno, da je stres ključni dejavnik, ki vpliva na duševno zdravje in zadovoljstvo zaposlenih. Z namenom izboljšanja duševnega zdravja so predlagani različni ukrepi za preprečevanje in zmanjšanje stresa, tako v smislu izboljšanja učinkovitosti in preventive, kakor tudi v smislu izboljšav fizičnega okolja.

Glede na raziskovalno vprašanje predmetne seminarske naloge, ki je bilo osredotočeno na nepremičninsko okolje, se mi zdijo zelo koristna priporočila obravnavanih člankov podjetij HOK in Haworth, ki predlagata konkretne ukrepe za izboljšanje fizičnega okolja, kot so na primer toplota, barve, hrup, ergonomika, svetloba, in drugi. Zanimiv se mi zdi tudi pozitiven učinek zmanjšanja stresa vezan na stik zaposlenih z zunanjimi zelenimi površinami in kot predlagajo tudi avtorji sami, bi bila zanimiva poglobljena analiza teh zelenih površin, kot je na primer velikost zunanjih območij, vrste drevnine, ki pozitivno vplivajo na razpoloženje in podobno.

Tako na evropskem kakor tudi na nacionalne nivoju obstaja veliko predpisov, ki urejajo področje zdravstvenega varstva. Njihov namen je zagotavljati varno, zdravo delo ter pozitivno delovno okolje ter izboljšati psihofizično stanje zaposlenih. Posledično se zmanjšajo stroški, ki nastanejo zaradi poškodb in bolezni, ter se izboljša gospodarska uspešnost. Kljub temu je zaradi ekonomske krize in njenih posledic potrebna aktivna vloga managementa za izboljšanje duševnega stanja zaposlenih.

Kot že rečeno v uvodu, preživimo večino dneva na delovnem mestu in z nepremičninskim okolje lahko dosežemo, da se tam dobro počutimo.

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